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OCCUPATIONAL OUTLOOK QUARTERLY

U.S. Department of Labor
Bureau of Labor Statistics
Summer 1982

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One Year After Graduation

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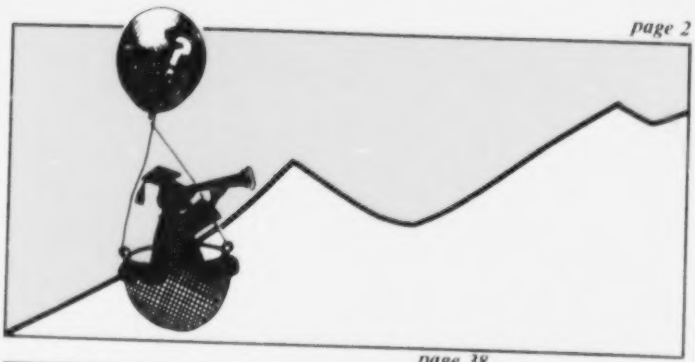
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Summer 1982
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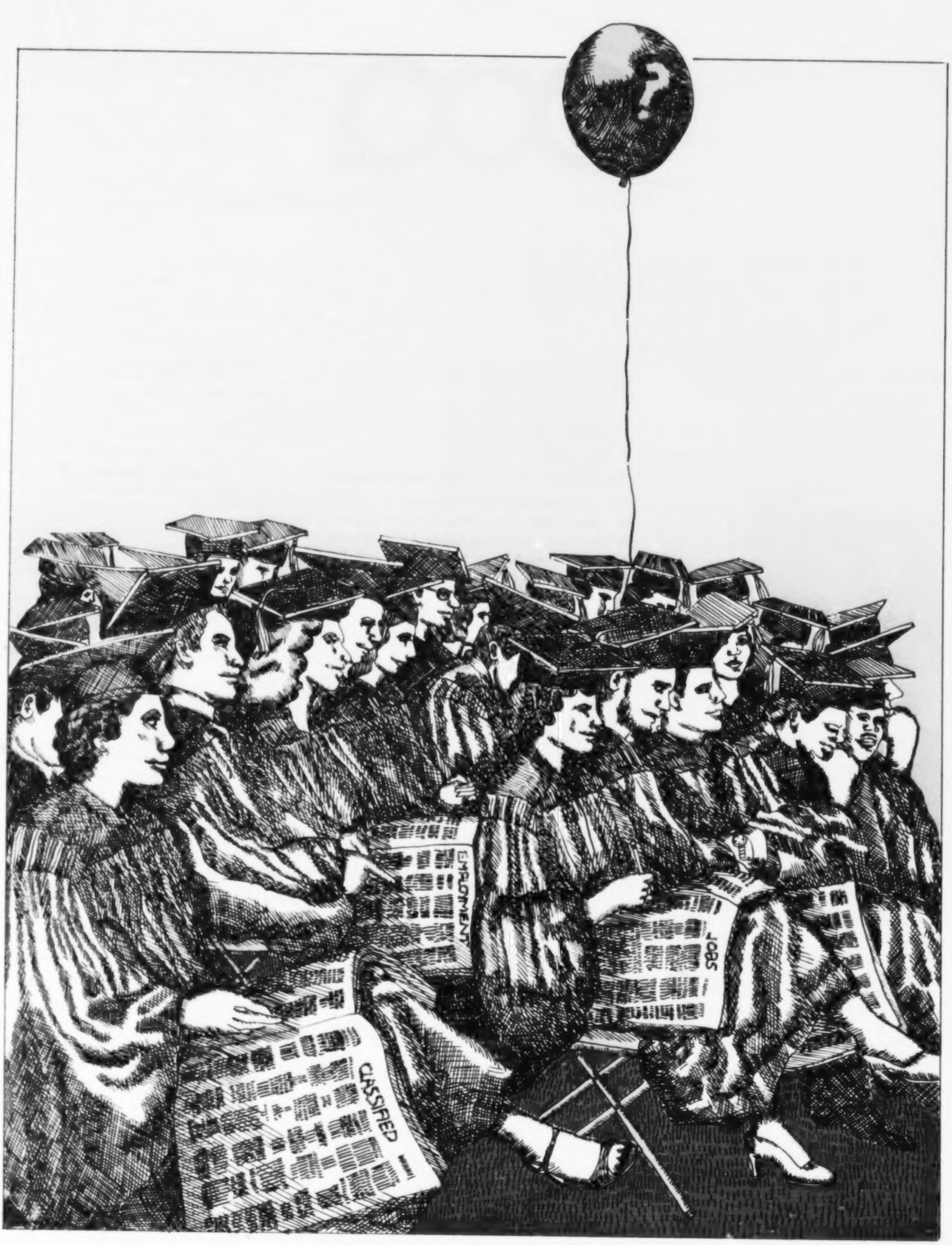

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The Job Outlook for College Graduates During the 1980's

by Jon Sargent

The Bureau of Labor Statistics prepares a new set of economic projections every 2 years encompassing the labor force, gross national product, industry output and employment, and occupational requirements. Findings of the latest analysis indicate that the job market for college graduates during the 1980's is expected to be similar to the highly competitive market that characterized the 1970's. Further details on the outlook for college graduates appear in the last section of this article, "Outlook for the 1980's."

There are several reasons for the projected imbalance between the number of entrants to the supply of college graduates and the number of job openings that will require at least a 4-year degree. These involve factors influencing the supply of college graduates, the college labor market of the 1970's, and occupational demand in the 1980's.

Supply of College Graduates

The supply of college graduates over the 1980-90 period will be strongly influenced by trends in the population, education, and the labor force.

Population trends. Although the Nation's population will continue to grow at a modest rate during the 1980's, major changes in its composition will occur—reflecting dramatic changes in the birth rate over the past 35 years. Between 1945 and the early 1960's, a high birth rate resulted in a large bulge in the population—the baby-boom generation. During the 1950's and 1960's, this bulge choked the educational system. During the mid-1960's, the members of this group began entering the labor force in unprecedented numbers.

Today, the leading edge of the baby-boom bulge is in its midthirties, while the trailing end is in its early twenties. The chart, "The Changing Age Structure of the Population," shows that, as this cohort moves from its twenties into its thirties during the next decade, the proportion of the population between 16 and 24—the typical ages for college attendance—will decline. The population between 16 and 24 years of age is expected to drop by about one-sixth during the 1980's, from 37.6 to 31.5 million.

Education trends. Since the baby-boom generation began entering the labor force in the mid-1960's, the amount of education completed by workers has increased substantially, as shown in the tabulation below.

	Percent distribution	
	1965	1980
Labor force total	100.0	100.0
Less than 4 years of high school	41.4	20.5
4 years of high school	36.4	41.9
1 to 3 years of college	10.6	18.6
4 or more years of college	11.6	19.0

The proportion of workers who did not have a high school diploma shrank to less than half its original size between 1965 and 1980, largely due to the retirement of many older workers who finished school before high school education was the norm.

The proportion of workers who completed postsecondary education grew as the baby-boom generation sought higher education in unprecedented numbers. With the rising attendance at 2-year community and junior colleges, workers with 1 to 3 years of college increased from less than 11 percent to nearly 19 percent; and the proportion of workers who completed at least 4 years of college expanded from less than 12 to 19 percent.

This growth in the educational attainment of the labor force is to a great extent the result of growth in the number of college graduates. The number of bachelor's degrees awarded increased from 502,000 during the 1964-65 school year to 929,000 during the 1979-80 school year, an increase of more than 85 percent. The number of bachelor's degrees awarded annually is expected to increase slowly during the early 1980's, but as the baby-boom cohort passes out of the typical ages of college attendance, the number of degrees granted annually is expected to fall. This decline should be softened, however, by continued increases in college attendance by older workers. By 1990, the number of bachelor's degrees awarded will settle back to about the 1980 level. On the average, however, slightly more bachelor's degrees will be awarded annually during the 1980-90 period than in 1980.

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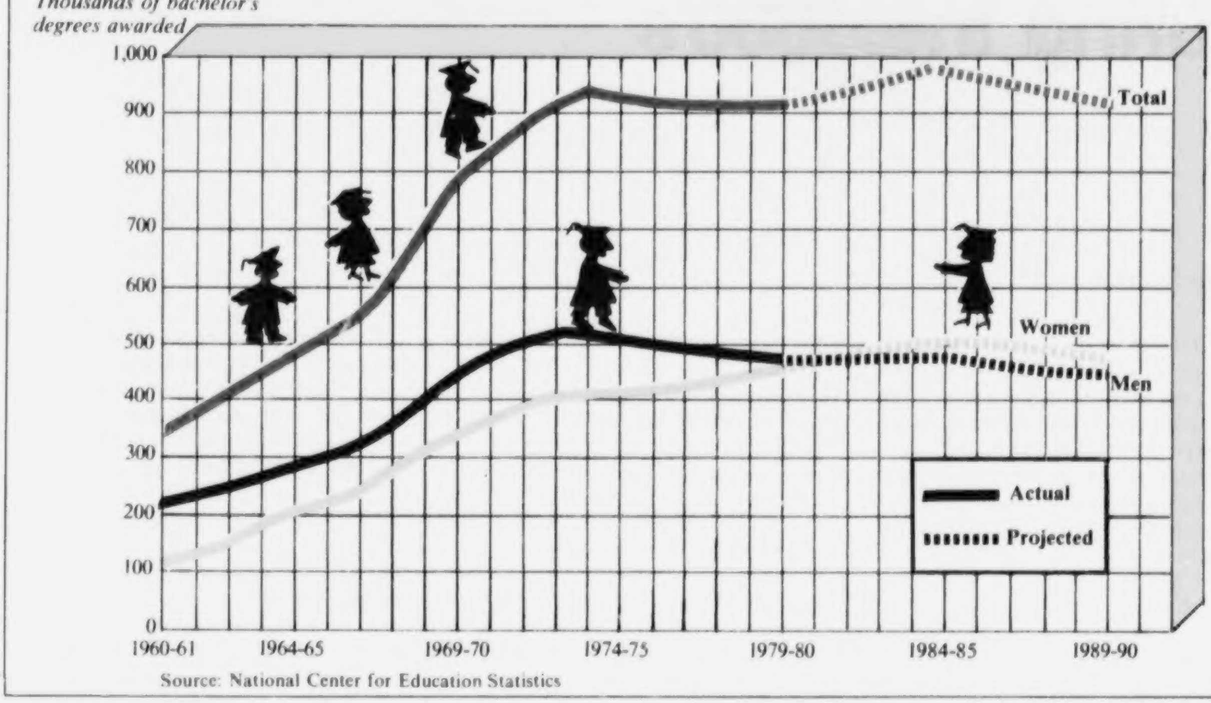
Chart 1. Bachelor's Degrees Awarded Increased Rapidly Until the Early 1970's but Then Leveled Off and Will Change Very Little Through the 1990's



Source: National Center for Education Statistics

Labor force trends. During the 1970's, continued increases in the labor force participation of women, coupled with the entrance of the baby-boom generation, produced a rapid increase in the number of college graduates in the civilian noninstitutional labor force. While the total labor force grew 31 percent between 1970 and 1980, the college graduate labor force increased a robust 85 percent, from slightly more than 10 million in 1970 to about 19 million in 1980. Women constituted a growing proportion of the college-educated labor force, increasing in number twice as fast as men.

Women college graduates were increasingly likely to be members of the labor force during the 1970's. The proportion of women with college degrees who were either employed or looking for work climbed from 59.6 percent in 1970 to 68.4 percent in 1980, continuing a long-term trend. This increase primarily stemmed from the growing tendency of married women graduates between the ages of 25 and 44 to combine work with family responsibilities. The proportion of this group in the labor force grew from 49 percent in 1970 to 69 percent in 1980; the proportions of other women graduates in the labor force increased only slightly over the period. The growing labor force commitment of women college graduates increased the impact of the baby-boom generation on the labor force. Their numbers were unprecedented, as was the proportion who sought jobs.

During the 1980's, the upward trend in the labor force participation rate of women is expected to continue, offsetting somewhat the impact of fewer people entering their twenties. Labor force growth will nevertheless slow. Women will account for about two-thirds of the labor force growth between 1980 and 1990.

The College Labor Market of the 1970's

When those in the baby-boom generation began receiving their bachelor's degrees in the late 1960's, the supply of college graduates—those either employed or looking for work—roughly balanced the number of jobs requiring a college degree. The total impact of this generation on the job market was delayed for several years, however, as many entered military service or pursued graduate studies. But beginning about 1970, the job market for college graduates deteriorated. As the Vietnam conflict wound down, the number of college graduates in the Armed Forces began to drop. The job market suddenly changed when these graduates began entering the labor force from the military and from the Nation's graduate schools. As the baby-boom generation flooded into the labor force in the 1970's, armed with college diplomas, the supply of college graduates began to outstrip the number of openings in jobs that traditionally had required a college degree.

Requirements for college graduates failed to keep pace with the supply in this period for two principal reasons. First, as the baby-boom generation began leaving school, school enrollments began to fall and employment growth in that sector began to slow. Since nearly one-fourth of all college graduates employed in 1970 were elementary or secondary school teachers, the impact was significant. Over the subsequent decade, teacher employment grew only one-fourth as fast as college graduate employment in general. Second, overall economic growth slowed during the 1970's. Particularly affected were many high-technology industries, another important source of jobs for college graduates. As fewer new jobs were created, an imbalance emerged between the supply of college graduates and the demand for them.

The occupational employment pattern of college graduates changed greatly during the 1970's, as the tabulation below illustrates.

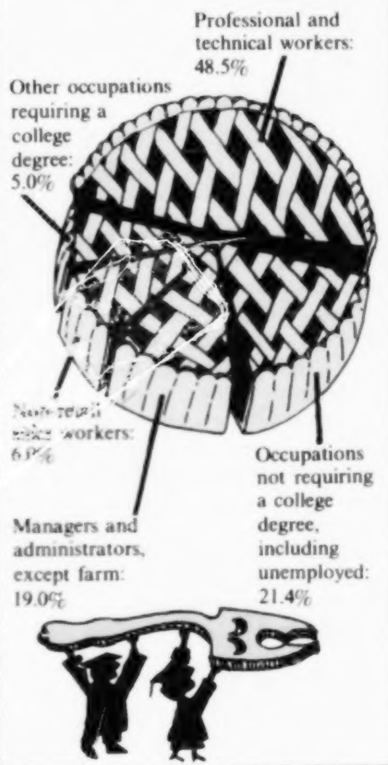
Employment of college graduates	Percent distribution 1970	1980
All occupations	100.0	100.0
Professional and technical workers	67.0	55.0
Managers and administrators	16.6	19.5
Sales workers	5.3	6.8
Clerical workers	6.3	9.0
Craft workers	1.8	3.3
Operatives	1.1	1.4
Laborers	0.2	0.8
Service workers	1.1	3.3
Farm workers	0.6	0.9

Between 1970 and 1980, the proportion of college graduates employed in professional and technical jobs dropped dramatically, from 67 percent to 55 percent, while it increased only slightly in managerial and sales jobs that have traditionally required college degrees. The most striking change, however, was the increase in the proportion of college educated workers employed in occupations that have not traditionally required a college education. During the 1970's, the proportion of college graduates employed in these occupations nearly doubled.

The overflow of college graduates into occupations that had not traditionally required college degrees is even more evident when one examines the jobs entered by college graduates joining the labor force between 1970 and 1980. Only about 48 percent of the approximately 1.4 million college graduates who entered the labor force annually—on average—found professional and technical jobs. About 19 percent entered managerial and administrative occupations and about 6 percent entered nonretail sales jobs. In all, nearly 75 percent of the graduates who entered the labor force during the 1970's found jobs in these three occupational groups that have traditionally employed substantial proportions of college graduates. The remainder entered retail sales, service, farm, and blue-collar jobs, occupations that had employed few graduates in the past. About 5 percent found work in the small number of these jobs that generally require a college education; but the great majority of graduates who took jobs in these occupations entered positions that did not require a college degree for entry. In all, about 1 out of 5 graduates who joined the labor force during the 1970's, either entered a job which did not require a college degree or experienced unemployment.

College graduates also experienced rising rates of unemployment during the 1970's. From 1970 to 1980, the unemployment rate for all college graduates increased from 1.5 percent to 2.0 percent, and for those age 20 to 24 it nearly doubled, from 2.4 percent to 4.5 percent. Although some of this increase can be attributed to economic conditions and generally higher levels of unemployment among all groups, it also reflects the increased difficulty that college graduates have more recently encounted in finding jobs. Young graduates nevertheless fared much better than high school graduates in their early twenties, who had an unemployment rate of 11.4 percent in 1980. The difference in rates between these two groups suggests that college graduates have had an edge in competing for many jobs that do not necessarily require a college degree.

Chart 2. Jobs Entered by College Graduates, 1970-80



Occupational Demand in the 1980's

Growth in the demand for college graduates is primarily the result of growth of those occupations that require a substantial proportion of workers

Table 1. Percent of Workers in Selected Occupational Categories With 4 Years of College or More, Selected Years 1959-80 and Projected 1990 Requirements

	Actual					Projected
	1959	1965	1970	1975	1980	1990
All occupations	10	12	13.2	16.8	19.1	16.9
Professional and technical	56.1	58.8	59.8	63.8	64	69.3
Managers and administrators, except farm	13.1	17.7	20.1	28.7	33.4	42.0
Non-retail sales workers	18.8	20.3	24.1	31.1	34.1	41.0
Other occupations	2.1	2.3	2.2	4.1	5.6	0.9

Source: Bureau of Labor Statistics

with college degrees, such as professional and technical occupations. In addition, many college graduates enter such occupations each year to replace workers who retire or leave the labor force to return to school or take on family responsibilities.

Educational upgrading is a second source of growth in demand for college graduates. This occurs when the amount of education required to enter an occupation increases over time as the work and the skills required to perform it become more complex and employers begin to seek college graduates to fill jobs not requiring a degree in the past. During the 1970's, most of the educational upgrading occurred in managerial and nonretail sales jobs.

Not all educational upgrading reflects changes in skill requirements, however. It may also simply reflect the tendency of employers to hire the most qualified people available. As the number of available graduates increases, employers raise their hiring standards and are still able to hire all the workers they need. At the same time, graduates faced with a tighter job market may lower their standards for what they consider appropriate employment.

The demand for college graduates in the 1980's was projected by analyzing trends in both occupational employment and educational upgrading within occupations. Alternate low and high projections of total occupational employment were developed as part of BLS's projections program, which featured differing assumptions about the economy's rate of growth over the 1980-90 period.

Under the conditions set forth in the low-projections alternative, the economy would grow at about the same rate as during the 1970's; while in the high-projections alternative, the economy would grow at about the same rate as during the 1960's. These low and high projections were viewed as the boundaries of the range in which 1990 employment could be expected to fall.

Based on trends in the proportion of workers with 4 or more years of college in the major occupational groups, ratios were projected reflecting the proportion of jobs in each group that could be expected to require a college degree. Projected requirements for college graduates were obtained by applying these projected ratios to the projections of total occupational employment.

During the 1970's, employment in professional and technical, managerial, and nonretail sales jobs—occupations generally requiring substantial proportions of workers with a degree—increased 40 percent, compared to about 28 percent growth for all workers. Between 1980 and 1990, employment in these occupations is projected to grow more slowly. They are expected to increase between 18 and 25 percent, depending on varying assumptions about growth in the economy, about as fast as the average for all occupations in the 1980's.

Educational upgrading was projected to occur in professional and technical, managerial and administrative, and nonretail sales occupations, continuing the trend toward greater complexity and skill requirements of many of these jobs, as well as employers' responses to a greater supply. A constant, but small, proportion of the jobs in other occupations was projected to require a college degree.

Outlook for the 1980's

College graduates entering the labor force during the 1980's are expected to encounter job market conditions very similar to those faced by entrants of the 1970's. About 15 million college graduates are projected to enter the labor force—about 60 percent are expected to be new graduates. Most of the remainder are expected to be reentrants—college-educated workers who left the labor force to raise a family, to pursue graduate education, or for other reasons.

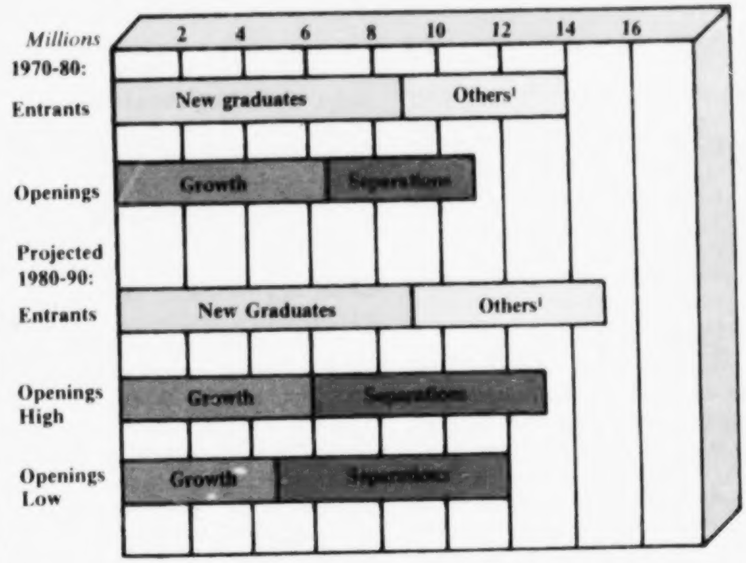
Depending on the amount of economic growth realized by the economy as a whole and employment growth in college-graduate-dominated occupations in particular, between 12 and 13 million graduates are projected to be required during the 1980's.

About 67 percent of the graduates are expected to be required in professional and technical occupations and 28 percent in managerial, administrative, and sales occupations. The majority will be needed to replace college graduates who are expected to retire or leave the labor force for other reasons over the period.

A surplus of between 2 and 3 million college graduates is expected to enter the labor force during the 1980's. If the economy grows as slowly as it did during the 1970's, the surplus would be the higher figure, an average annual surplus of about 300,000 college graduates — about 1 graduate in 5, just as in the 1970's. If the economy grows more rapidly than it did in the 1970's, the average surplus would be about 200,000 college graduates — about 1 in 7 — each year.

Even with more rapid growth, however, the job market experienced by college graduates in the 1980's is unlikely to be more favorable than in the 1970's. In 1980, a surplus of college graduates estimated at 3.8 million was already in the labor force, either employed in jobs that did not require their level of education or unemployed. Of course, many of these have since begun satisfying careers in occupations that do not require 4 years of college education. Others, however, can be expected to compete for jobs that more fully utilize their education. The job market will be more competitive to the extent that this pool of underemployed 1970's entrants competes along with 1980's entrants for job openings requiring a college degree.

Chart 3. As During the 1970's, College Graduates Entering the Labor Force During the 1980's Are Expected to Exceed Openings by as Much as 3 Million



[1] Reentrants, immigrants, entrants from military, etc.

Source: Bureau of Labor Statistics.

Like college graduates in the 1970's, future college graduates cannot be assured that they will find jobs in the occupations of their choice. Many may experience periods of unemployment, have to relocate to other areas of the country, or job-hop before finding one that satisfies them. As in the 1970's, some may have to compete with nongraduates for the more desirable jobs not previously filled by graduates, but in many cases, their additional education will prove to be an advantage. Even though a college degree may not be required, many employers prefer to hire the best educated candidate who is qualified for a job. In many cases, a college graduate will also have an advantage in gaining promotion in non-college careers over those without degrees. Many graduates who are forced to start work in jobs for which they are overqualified nevertheless may gain useful experience that will be an advantage in competing later for more challenging jobs. Graduates who make a wise career choice and who are best prepared to enter the job market should make a smooth transition from school to work. Those who are not will end up scrambling for the best available jobs. Most graduates, however, will probably find a job and few should face sustained unemployment.

A college degree is not the reliable ticket to a good job that it once was, but it nevertheless is a prerequisite for a growing proportion of jobs. The other benefits of a college education remain, however, including opportunities for learning, personal development, and broadening interests.

The articles that follow describe the labor market experience of recent college graduates in selected major fields of study and the types of jobs they obtained. ooq

The Class of '77
One Year After

by Daniel E. Hecker

Ask a college student, "What's your major," and you'll find out the kinds of occupations they might enter after graduation. A survey conducted by the National Center for Education Statistics (NCES) shows that graduates of certain programs are more likely to wind up in professional jobs than graduates of other programs.

Your choice of a major does not 'track' you for a single occupation. In fact, this article presents information on the wide range of occupations entered by graduates with degrees in the same major. Nevertheless, at least in the short run, the undergraduate major selected goes far toward determining the entry-level jobs that a graduate is qualified for.

The information collected by NCES concerns the labor force status in February 1978 of the people who received bachelor's degrees between July 1976 and June 1977. BLS has analyzed this data for all graduates and for each of 19 major fields of study. This article presents information on the labor force status, occupations of employed graduates, and graduate school status of graduates in each of these groups.

Labor force status is given in tabular form according to five classifications in the labor force, employed full time, employed part time, unemployed (not employed but seeking employment), and not in the labor force (not employed and not seeking employment or in the military). Following the tabulation is an explanation of why graduates worked part time or were not in the labor force.

Occupations of employed graduates are grouped in two categories: Occupations generally requiring a degree for entry (defined for this article as professional and technical, managerial and administrative, and nonretail sales jobs) and occupations not generally requiring a degree for entry, including retail sales, clerical, blue-collar (craft, operatives, and laborers) and service. Among those usually requiring a degree, occupations related to the graduate's major are listed first, beginning in most cases with the occupation that employed the most graduates. Next, occupations not related to the major are listed, also beginning with the occupation that employed the most graduates. Finally, occupations entered by only a few of the graduates are listed in alphabetical order. For the occupations not generally requiring a degree, occupational groups are listed according to the number of graduates they employed, with occupations within each group listed afterwards.

The graduate school status of the people surveyed is also presented in tabular form. Percentages are given for the total enrolled, total enrolled full time, total working for an advanced degree, and enrollment by field of study.

Graphic presentations of much of this information are included for all graduates and for each major.

This information should be helpful to those choosing a major field of study because it indicates the job possibilities for graduates with a degree in the major fields that are discussed. However, readers using this information for such occupational guidance should keep a number of points in mind:

- The estimates are based on information obtained from a sample of about 7,500 people who received bachelor's degrees between July 1976 and June 1977. Therefore, they could differ from figures that would have been obtained if a census, or survey of all graduates, had been taken.
- The information was collected only a short time after graduation. The occupational patterns are likely to change as graduates gain experience or further education. Occupational mobility is high for all workers, but it is particularly high for young workers. People not only transfer among occupations within a broad occupational group, such as "professional," but they also tend to move from blue-collar, clerical, and service jobs, to professional and managerial jobs; and, within the last category, from professional jobs to managerial jobs. Liberal arts graduates, in particular, may not have a clear career objective by graduation and may change occupations often in an attempt to find work that fits their abilities and expectations. Earlier studies indicate that liberal arts graduates, who are less likely than other graduates to start out in jobs generally requiring a college degree for entry, tend to "catch up" later on. Because the data were collected so shortly after graduation, they also understate the number who might eventually enroll in graduate school, since

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Graduation

many people do not enroll until a year or more after graduation.

- The occupational patterns for each major reflect the relation between the number of graduates attracted to certain occupations and the number of graduates with particular qualifications that employers sought to hire in 1977 and 1978. A high proportion of graduates entering an occupation would indicate that many graduates with that particular major found the occupation attractive, that sufficient openings existed, and that employers preferred those graduates to other applicants. If no graduates or a low proportion of graduates with a particular major entered an occupation, either those graduates did not seek jobs in the occupation or employers chose not to hire them.[1]

- Major field of study is only one aspect of an individual's job qualifications. Minor field of study or elective courses, extracurricular activities, quality of school attended, grades, work experience, and personality traits such as motivation, self-confidence, and ability to express oneself all are factors that employers take into consideration. Furthermore, hiring standards differ. Just because some graduates in a certain major field of study entered particular occupations does not mean that everyone with that major would qualify for those jobs. Conversely, some graduates are able to enter occupations not mentioned in this article.

All Graduates

Labor Force Status

The following tabulation summarizes the labor force status of all graduates.

In labor force	86 percent
Employed full time	69
Employed part time	12
Unemployed	5
Not in labor force	14

Five percent of all graduates worked part time because they were in school, 2 percent preferred to work part time, and 2 percent had jobs for which the full-time work week was less than 35 hours. Only 2 percent worked part time because they could not find full-time positions; most of these were elementary and secondary school teachers. One percent worked part time for other reasons. Among all graduates, 8 percent were not in the labor force because of school, 1.5 percent had family responsibilities, and 4.5 percent gave reasons such as didn't want to work, ill or disabled, or couldn't find the work they wanted.

The rate at which graduates participate in the labor force varied widely from major to major. (See table 1.) Graduates whose majors were closely linked to specific occupations, such as communications, agriculture, business administration, education, nursing, and engineering, had a higher than average labor force participation rate. Graduates in arts and science—which includes biological sciences, mathematics, physical sciences, social sciences, humanities, and psychology—generally had lower than average labor force participation rates.

The difference between the two groups is largely explained by the different rate at which the group members attended graduate school full time. A low proportion of graduates in occupation-related majors went to graduate school full time. On the other hand, many arts and science graduates had taken preprofessional programs—such as prelaw

Table 1. Percent of 1976-77 Bachelor's Degree Recipients in Civilian Labor Force in February 1978, by Major Field of Study

Major Field of Study	Percent
Communications	97
Accounting	95
Agriculture and natural resources	95
Physical education	95
Nursing	94
Education, except physical education	93
Business and management, except accounting	91
Engineering	91
Art	90
All graduates	86
Sociology	86
Home economics	82
Mathematics	82
English	80
Economics	79
Psychology	79
History	75
Chemistry	70
Biological sciences	67
Political science	65

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[1] Information on job prospects for occupations discussed in this article can be found in the *Occupational Outlook Handbook, 1982-83 Edition.*

and premedicine—or planned to enter occupations for which master's or doctorate degrees are usually required. A large proportion, therefore, were enrolled full time in graduate school at the time of the survey.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Seventy-two percent of the employed graduates in the civilian labor force worked in professional, managerial, and nonretail sales occupations, jobs that generally require a degree for entry. Fifty-six percent were professional, 11 percent were managerial, and 5 percent were nonretail sales.

Despite the decline in the number of job openings in teaching during the 1970's, elementary and secondary school teaching was by far the most common professional, managerial and nonretail sales occupation, with 16 percent of graduates employed. Six percent of all graduates were accountants; 5 percent engineers; 4 percent registered nurses; 3 percent managers in wholesale and retail trade; and 2 percent each, social workers, engineering and science technicians, and computer specialists (programmers, systems analysts, and others).

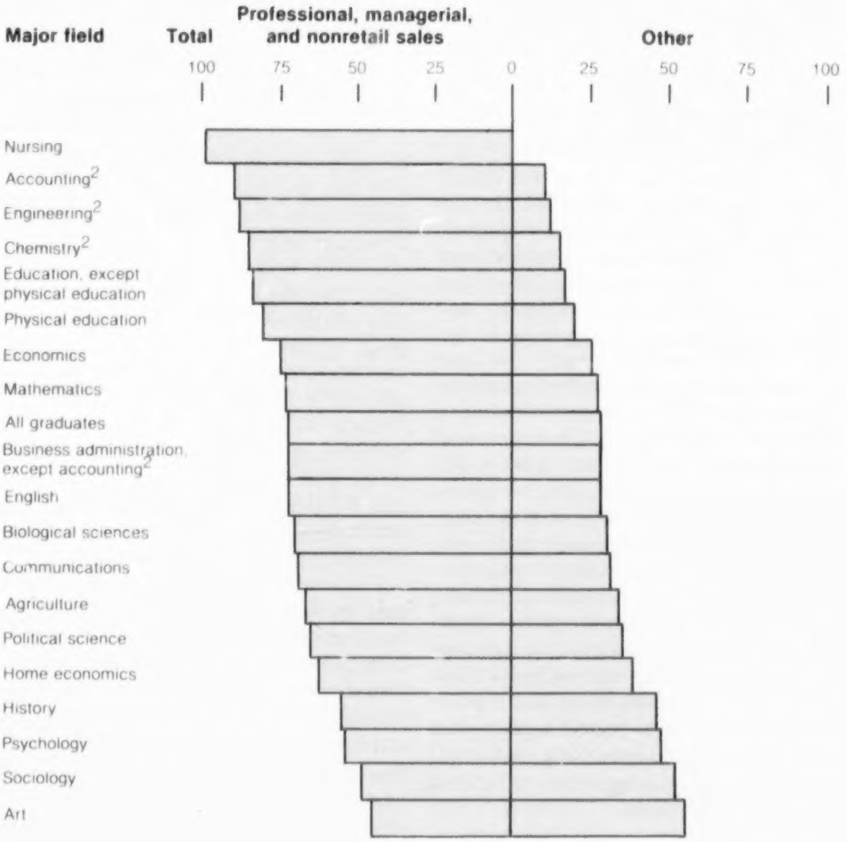
At least half of one percent of all employed graduates (or about 4,000) reported being in each of the following occupations: Bank officer, designer, economist, editor and reporter, health administrator, insurance agent, manager in manufacturing, medical laboratory technician, part-time teacher and research worker in college and universities (mostly graduate students), personnel worker, public administration (government) official, public relations worker, recreation worker, therapist, and pharmacist. Many other occupations were also mentioned; these are listed in the articles for specific majors.

Occupations not generally requiring a degree for entry. Twenty-eight percent of the employed graduates worked in clerical (14 percent), service (6 percent), craft (3 percent), retail sales (2 percent), operative (2 percent), and laborer (1 percent) jobs. Research conducted for the *Occupational Outlook Handbook* indicates that few jobs in these occupational groups generally require a degree for entry; and, in fact, few reporting these occupations indicated that a degree was required in order to obtain their job. Most were probably underemployed. Many wanted jobs requiring a degree but couldn't find them. Some, however, were underemployed by choice. About 18 percent of the graduates employed in these occupational groups also were engaged in graduate studies. Many of them said that they took a job not requiring a degree for entry in order to earn money while in school. Some preferred the job they had to ones they found that required a degree, others liked the job they had as undergraduates, so they didn't apply for a different one.

Graduates of most occupation-related programs were more likely than average to be in professional, managerial, and nonretail sales occupations. (See chart 1.) Arts and science graduates (except for those in chemistry, economics, and mathematics) were less likely than average to have entered these occupations.

Overall, about 62 percent of arts and science graduates were in occupations generally requiring a degree for entry. While the proportion is lower than the average for all graduates, the information clearly shows that arts and science graduates are able to enter college-level jobs not only in teaching and in other

Chart 1. Proportion of Employed Graduates in **Professional, Managerial and Nonretail Sales Occupations**[1] by Major Field of Study



[1] Occupations generally requiring a degree for entry.

[2] About a third of those in the "other" group were in jobs which appear to be trainee positions for recent college graduates.

occupations related to their major but also in a range of other professional, managerial, and sales jobs in business and government.

Graduate Study

The following tabulation shows the graduate school status of all graduates.

Enrolled	25 percent
Full time	16
Working toward advanced degree	21
Field	
Business and management	3
Education	3
Law	3
Health except medicine	2
Biological sciences	1
Engineering	1
Medicine	1
Public affairs	1
Physical sciences	1
Psychology	1
Social sciences	1
Other fields	3

All of the M.D. candidates and most of the other health degree candidates were studying full time. More than half the education degree candidates, however, were studying part-time (probably because they were employed full time as teachers); and almost half of the business degree candidates were part-timers. Most students in other fields were studying full time.

A lower than average proportion of those with occupation-related degrees were enrolled in graduate school and an even lower proportion enrolled full time. This is probably due, again, to the fact that a bachelor's degree in these majors is adequate preparation for most positions in corresponding occupations. A much higher than average proportion of arts and science graduates were in graduate school, for reasons cited earlier.

Here's What 1976-77 **Graduates** did in 1978

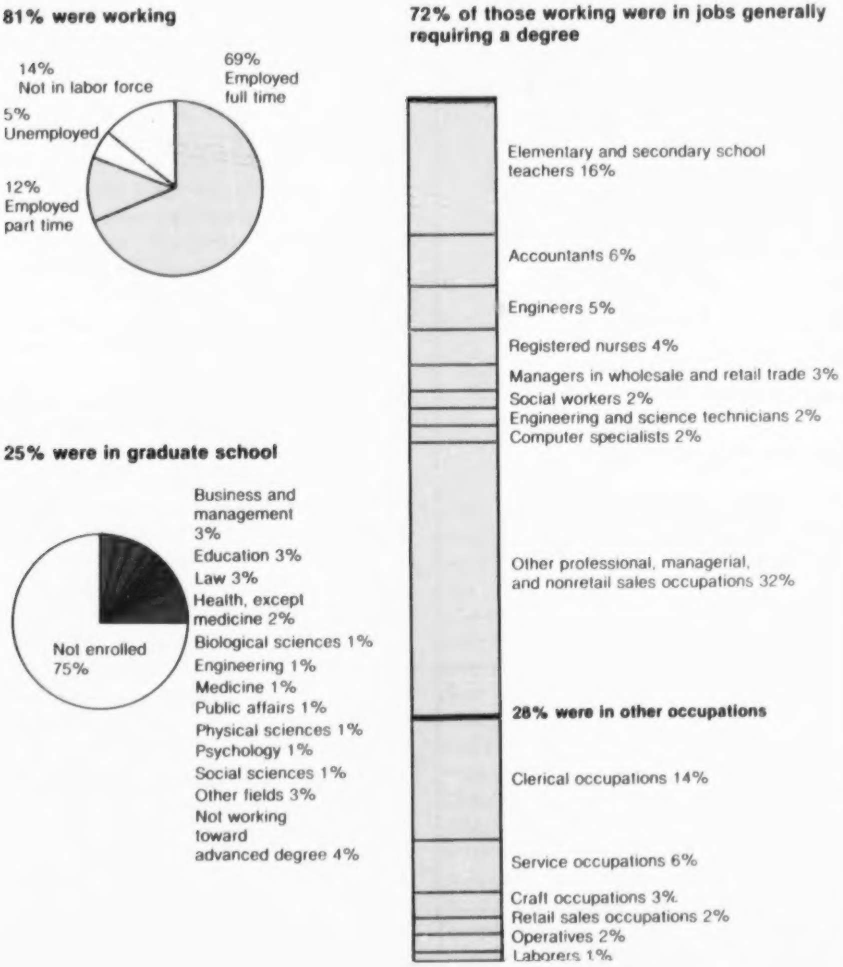


Table 2. Percent of 1976-77 Bachelor's Degree Recipients Enrolled in a Graduate Program, February 1978, by Major Undergraduate Field

Major Undergraduate Field	Graduate Enrollments Total	Full-time Study	In a Degree Program
Political science	55	43	50
Biological sciences	49	39	42
Chemistry	44	37	41
Economics	36	27	29
Psychology	34	25	30
Mathematics	31	20	27
English	31	18	27
History	28	17	23
All graduates	25	16	21
Sociology	25	13	16
Agriculture and natural resources	21	14	15
Engineering	20	12	18
Education, except physical education	18	6	15
Business and management, except accounting	17	8	13
Nursing	14	8	10
Physical education	14	7	12
Communications	14	7	10
Home economics	13	7	11
Art	12	4	8
Accounting	9	6	6

Accounting

Labor Force Status

The following tabulation summarizes the labor force status of accounting graduates.

In labor force	95 percent
Employed full time	90
Employed part time	3
Unemployed	2
Not in labor force	5

Three percent of all the accounting graduates were not in the labor force because they were in school and two percent had other reasons.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Eighty-nine percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Seventy-seven percent were accountants, almost all in work closely related to their major. Forty-three percent of them were with accounting, auditing, and bookkeeping firms; 23 percent were with manufacturing firms; 8 percent were in public administration (government); 5 percent with wholesale and retail trade firms; and 3 percent each with banks, credit agencies, and insurance companies; 2 percent each with hospitals and petroleum extraction companies; and 8 percent in other industries.

Three percent were in other occupations related to accounting, all doing work closely related to their major. One percent were computer specialists, 1 percent were credit managers, and 1 percent were graduate students teaching business in colleges and universities part time.

Another 9 percent were in occupations not directly related to accounting. Their work was generally only somewhat or not at all related to their major. They were advertising agents, buyers, economists, electronics technicians, managers in manufacturing industries, personnel workers, public administration (government) officials, real estate agents, retail trade managers, and sales managers outside retail trade.

Occupations not generally requiring a degree for entry. Eleven percent of the employed graduates were in occupations that do not usually require a college degree. Six percent were clerical workers—including the 2 percent of the employed graduates who were bookkeepers who said a degree was required to obtain their job. Three percent were service workers—two percent of whom were classified as police officers and detectives. Unlike most other police officers in the survey, all said a degree was required to obtain their job. They probably were in jobs for which accounting majors are sought, such as F.B.I. and Treasury Agents. One percent were blue collar workers, and 1 percent retail trade sales workers.

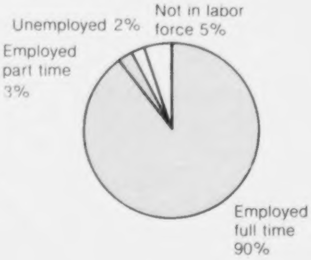
Graduate Study

The following tabulation shows the graduate school status of accounting graduates.

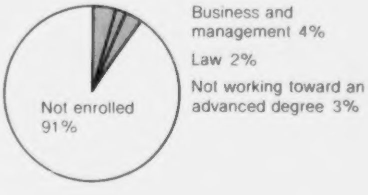
Enrolled	9 percent
Full time	6
Working toward advanced degree	6
Field	
Business and management	4
Law	2

Here's What 1976-77 Graduates in **Accounting** did in 1978

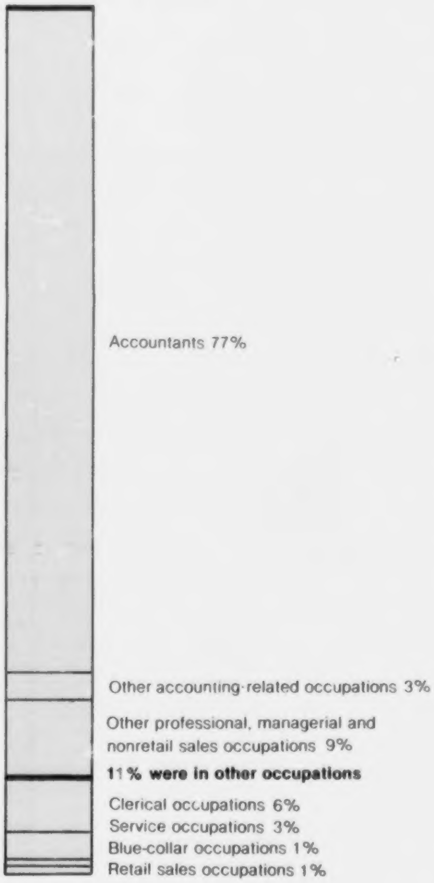
93% were working



9% were in graduate school



89% of those working were in jobs generally requiring a degree



Agriculture and Natural Resources

Labor Force Status
The following tabulation shows the labor force status of agriculture and natural resources graduates.

In labor force	95 percent
Employed full time	73
Employed part time	16
Unemployed	6
Not in labor force	5

Most part-timers were in school.

Occupations of Employed Graduates
Occupations generally requiring a degree for entry. Sixty-six percent of the employed graduates were in professional, managerial, and nonretail sales jobs or were farm owners or managers. Almost all in these jobs were doing work closely or somewhat related to agriculture and natural resources.

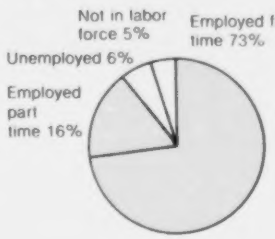
Seven percent of the graduates were foresters and conservationists; 7 percent were agricultural, biological, or other science and engineering technicians; and 7 percent were elementary and secondary school teachers, teaching agriculture and other subjects closely related to their major. Six percent were farmers (owners and tenants) and farm managers. Five percent were agricultural scientists, and 5 percent were bank officers and credit managers who said their work was related to their major. Four percent were public administration (government) officials; 4 percent were graduate students employed as research workers in college and universities part-time; and 4 percent were managers in food product manufacturing or wholesaling.

Seventeen percent of the graduates in the labor force were in a variety of other occupations doing work related to their major, namely, architect, atmospheric and space scientist, building manager (which includes grounds superintendent), college administrator, engineer, farm management advisor, manufacturers' sales worker, public relations worker, and purchasing agent.

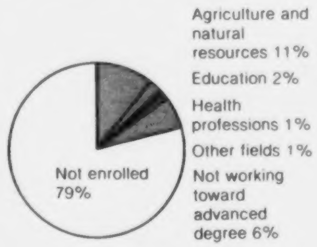
Occupations not generally requiring a degree for entry. Thirty-four percent of the employed graduates were in jobs not usually requiring a degree. Nine percent were craft workers, 6 percent were farm supervisors and laborers, 6 percent were other laborers, 5 percent were clerical, 4 percent were operatives, and 4 percent were service workers. About a quarter of the craft workers were blue-collar worker supervisors who said a degree was required to obtain their job and that their work was closely related to their that major. None of the other in these jobs said a degree was required for entry, and only a few in jobs as farm supervisor and laborer and other laborer said their work was related to their major. Most people in these jobs probably were underemployed. Some were in these jobs because they preferred them to ones requiring a degree; others took them primarily to earn

Here's What 1976-77 Graduates in **Agriculture and Natural Resources** did in 1978

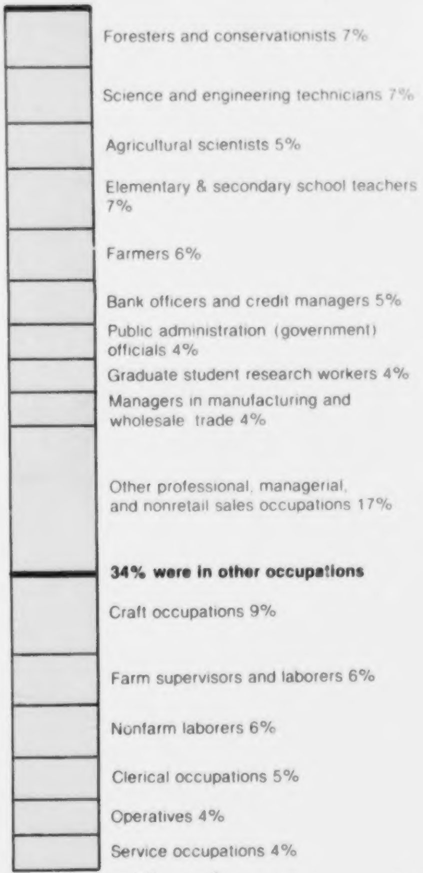
89% were working



21% were in graduate school



66% of those working were in jobs generally requiring a degree



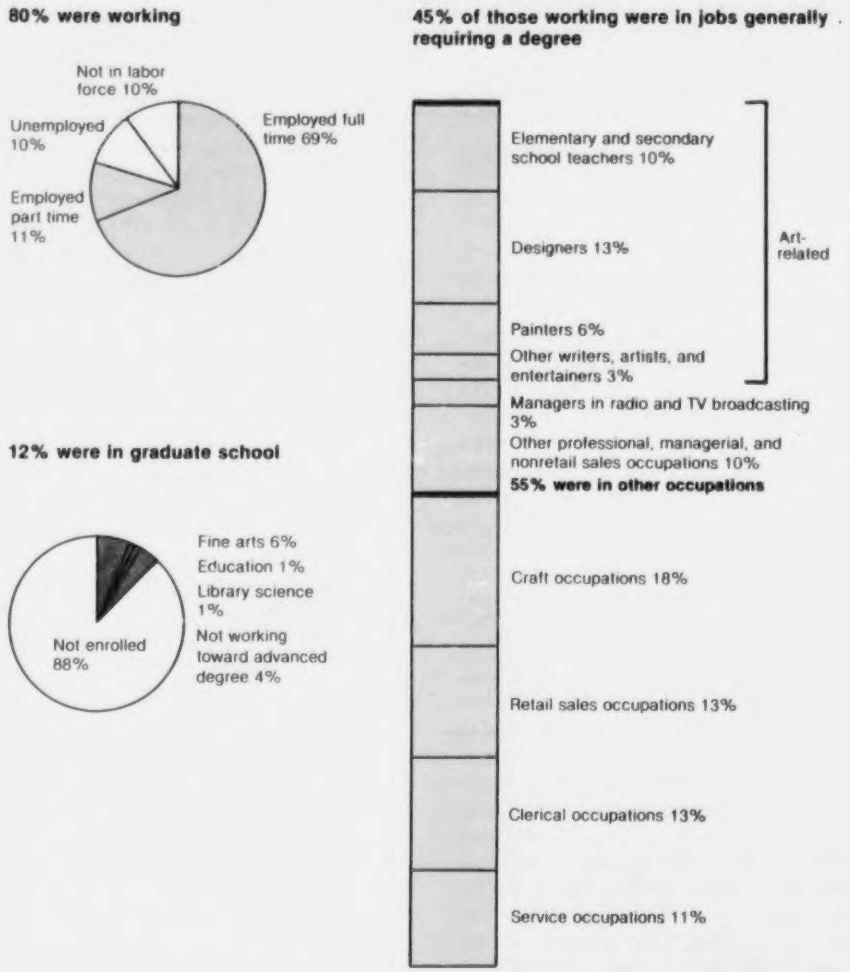
money while in school or couldn't find any other jobs.

Graduate Study
The following tabulation shows the graduate school status of agriculture and natural resources graduates.

Enrolled in a college or university	21 percent
Full time	14
Working toward an advanced degree	15
Field	
Agriculture and natural resources	11
Education	2
Health professions	1
Other fields	1

Art

Here's What 1976-77 Graduates in **Art** did in 1978



Labor Force Status
The following tabulation summarizes the labor force status of art graduates.

In labor force	90 percent
Employed full time	69
Employed part time	11
Unemployed	10
Not in labor force	10

Among all art graduates, 3 percent worked part time because they could not find full-time work; the rest of the part-timers were in school or had other reasons for working part time. Also among all art graduates, 4 percent did not wish to work; 6 percent had other reasons for not being in the labor force.

Occupations of Employed Graduates
Occupations generally requiring a degree for entry. Only 45 percent of the employed graduates were in professional, managerial, and nonretail sales occupations.

Thirty-two percent were in art-related jobs. Ten percent were elementary and secondary school teachers. Most were doing work closely related to their major. About two-thirds of the teachers were part-timers, half of whom wanted but could not find a satisfactory full-time teaching job.

Thirteen percent were designers and 6 percent were painters. Three percent were in various writer, artist, and entertainer positions, doing work closely or somewhat related to their major.

Thirteen percent were in other college-level occupations, doing work only somewhat or not at all related to their major. Three percent were managers in radio and television broadcasting, and 10 percent were in the following occupations: Accountant, clergy, librarian, research worker, securities sales worker, and teacher (except school teacher).

Occupations not generally requiring a degree for entry. Fifty-five percent of the employed graduates were in occupations which generally do not require a degree for entry. Eighteen percent were craft workers or operatives—6 percent were in work closely related and 7 percent said their work was somewhat related to their major. Thirteen percent were retail trade sales workers and 13 percent were clerical workers—mostly secretaries. Eleven percent were service workers—most of whom were police officers and detectives who had been in their jobs before they received their degrees. Very few in these occupations said a degree was required for entry. Some in these jobs preferred them to those that required a degree or just kept the job they had before graduation. Many, however, couldn't find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of art graduates.

Enrolled	12 percent
Full time	4
Working toward advanced degree	8
Field	
Fine arts	6
Education	1
Library science	1

Biological Sciences

Labor Force Status

The following tabulation summarizes the labor force status of biological sciences graduates.

In labor force	67 percent
Employed full time	46
Employed part time	14
Unemployed	7
Not in labor force	33

Among all graduates, about 29 percent were not in the labor force because they were in school, 3 percent had family responsibilities, and 1 percent had other reasons. Most part-timers were in school.

Occupations of Employed Graduates

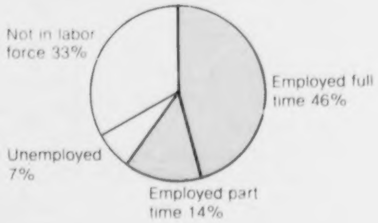
Occupations generally requiring a degree for entry. Seventy percent of the employed graduates were in professional, managerial, and nonretail sales jobs. Three percent were biological scientists, almost all in jobs closely related to their major. The low percent who were biological scientists is understandable, since most professional jobs in biology require an advanced degree for entry.

Twenty-four percent were in health-related occupations—19 percent were clinical laboratory technologists and technicians or other health technologists and technicians. Most reported their work as closely related to their major field of study. About 3 percent were registered nurses, pharmacists, and optometrists; they must have had previous educational preparation which enabled them to meet licensing requirements to practice these occupations. Two percent were therapists and health administrators. Most reported their work somewhat related to their major.

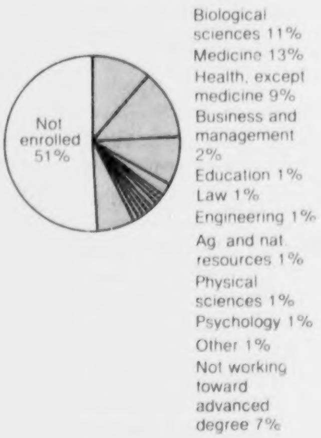
Fifteen percent were engineering and science technicians—8 percent were agricultural and biological technicians, and 7 percent were chemistry and engi-

Here's What 1976-77 Graduates in **Biological Sciences** did in 1978

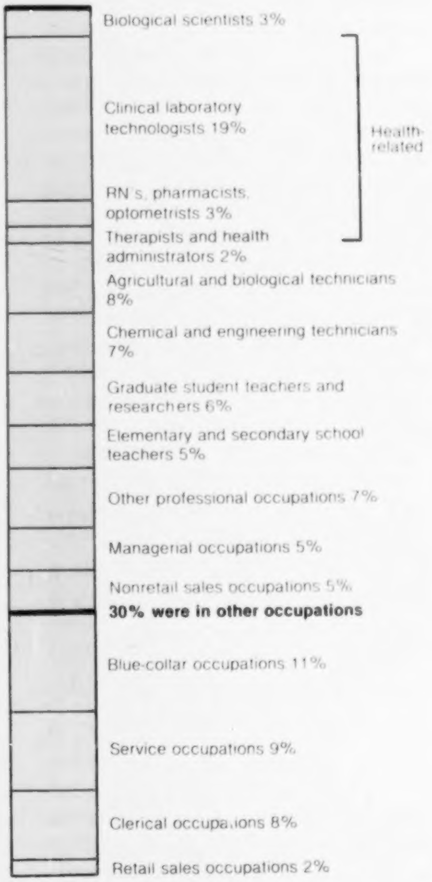
60% were working



49% were in graduate school



70% of those working were in jobs generally requiring a degree



neering technicians. Most of the agricultural and biological technicians reported that their work was closely related to their major and that a degree was required to obtain their job. Chemical and engineering technicians were more likely to be doing work only somewhat related to their major and were about evenly divided on whether a degree was required to obtain their job.

Six percent were graduate students employed as college teachers or research workers. All were employed part time and doing work closely related to their major.

Five percent were elementary and secondary school teachers. Most were secondary school biological or physical science teachers.

Seven percent were in professional occupations other than those above, including chemist, embalmer, engineer, psychologist, public relations worker, statistician, and vocational and education counselor. All reported that their work was only somewhat or not at all related to their major.

Five percent were in managerial jobs—bank officers, public administration (government) officials, restaurant managers, and managers in grocery stores and the construction industry. Five percent were in nonretail sales jobs—insurance agents as well as manufacturers' and wholesale trades sales workers—most in machinery manufacturing industries and in wholesale drugs, farm products, machinery and paper.

Occupations not generally requiring a degree for entry. Thirty percent of the employed graduates were in jobs that do not usually require a college degree. Eleven percent were in blue collar, 9 percent were in service, eight percent were in clerical, and 2 percent were in retail sales jobs. Respondents said a degree was not needed to enter any of these jobs, except for blue-collar worker supervisor, with about 1 percent of graduates. Few jobs were related to biological sciences except for the health-related service occupations of health trainee and nursing aide, with about 7 percent of graduates. Unrelated jobs included bartender and waiter, dental assistant, expediter and production controller, guard, secretary, shipping clerk, and statistical clerk. Most people in these jobs were probably underemployed. About a third of those in these occupational groups were enrolled for an advanced degree, and a substantial proportion of them—particularly of clerical and service workers—said they took a job not requiring a degree primarily to earn money for school. Some preferred these jobs to ones requiring a degree for entry; others could not find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of biology graduates.

Enrolled	49 percent
Full time	39
Working toward advanced degree	42
Field	
Biological sciences	11
Medicine	13
Health except medicine	9
Business and management	2
Education	1
Law	1
Engineering	1
Agriculture and natural resources	1
Physical sciences	1
Psychology	1
Other fields	1

Most part-time graduate students were not working towards a degree.

Business and Management, Except Accounting

Labor Force Status

The following tabulation summarizes the labor force status of business and management (except accounting) graduates.

In labor force	91 percent
Employed full time	82
Employed part time	6
Unemployed	3
Not in labor force	9

Among all the graduates, 4 percent were not in the labor force because they were in school, 2 percent had family responsibilities, and 3 percent were in the military.

Occupations of Employed Graduates

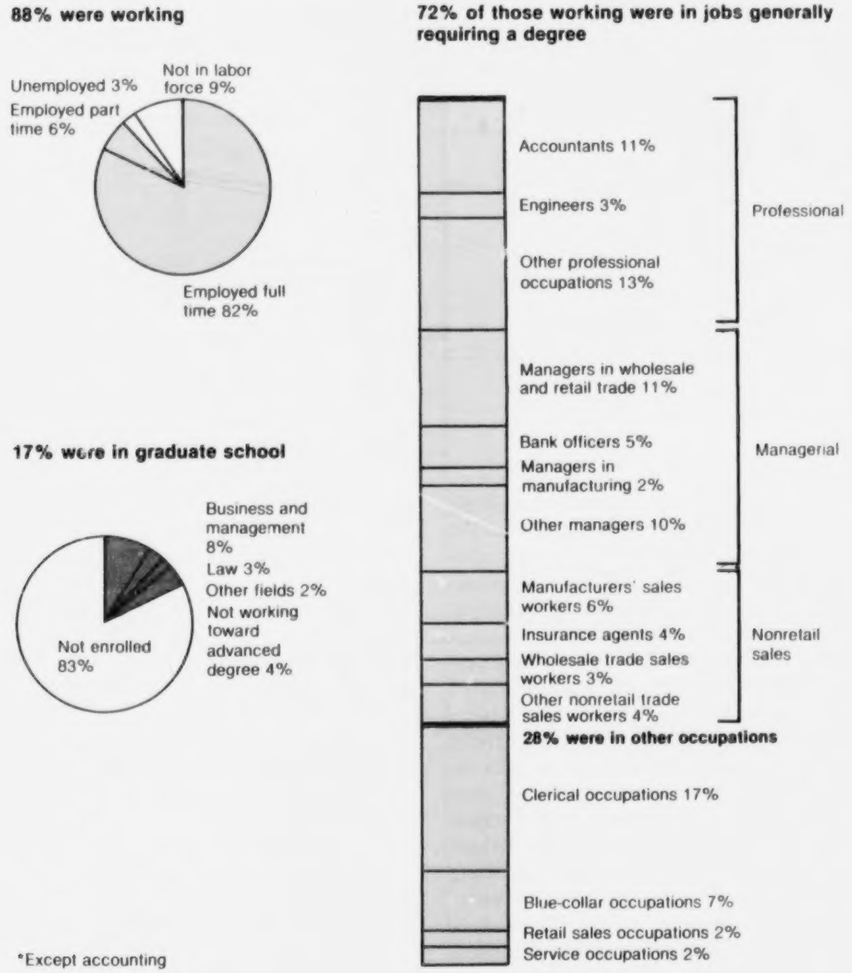
Occupations generally requiring a degree for entry. Seventy-two percent of the employee graduates were in professional, managerial, and nonretail sales jobs. More than half were in jobs closely related to their major; most of the rest were in jobs somewhat related to their major.

Twenty-seven percent were professional workers. Eleven percent were accountants, most doing work closely related to their major. Three percent were engineers; most of these were industrial engineers and some had been engineers before they received their business degrees. The other 13 percent reported the following occupations: Actuary, computer specialist, economist, editor and reporter, elementary and secondary school teacher, engineering and science technician, graduate student teaching or doing research in colleges and universities part time, operations research analyst, personnel worker, social worker, and statistician.

Twenty-eight percent were managers. Eleven percent were buyers, sales managers, and other managers in wholesale and retail trade. Five percent were bank officers. Two percent were managers in manufacturing. Other respondents were in the following occupations: Manager in insurance, transportation, agriculture, construction and finance industries and in elementary and secondary schools and colleges and universities; public administration (government) official; purchasing agent; restaurant manager; and sales manager except in retail trade.

Seventeen percent were nonretail sales workers. (Among marketing and purchasing graduates—a subgroup of the business majors—37 percent were nonretail sales workers.) About 6 percent were manufacturers' sales workers, with 4 percent in the machinery manufacturing industry, selling products such as computers, office and factory machinery and electrical equipment. Four percent were insurance agents and three percent were wholesale trade sales workers, selling items such as machinery, chemicals, food, and paper. Two percent were in business and repair and professional services, and 2 percent were real estate, securities, and other sales workers.

Here's What 1976-77 Graduates in **Business and Management*** did in 1978


88% were working

17% were in graduate school

72% of those working were in jobs generally requiring a degree

*Except accounting

Occupations not generally requiring a degree for entry. Twenty-eight percent of the employed graduates were in occupations that do not usually require a degree. Seventeen percent were clerical workers; however, in contrast to other graduates, most business graduates who were clerical workers said their work was related to their major. Although a college degree is an entry requirement for only a very small proportion of all clerical jobs, more than a third of the business graduates in clerical jobs said a degree was required to obtain the job they held. About 2 percent were bookkeepers. Others were in the following occupations: Cashier, clerical supervisor, estimator and investigator, expediter and production controller, insurance adjuster, postal clerk, real estate appraiser, secretary, shipping clerk, and stock clerk.

Seven percent were blue collar workers—craft workers, operatives, and laborers. Three percent were blue collar worker supervisors. A large proportion of these said a degree was required to obtain their job and almost all said their work was related to their major. Most probably were in trainee positions for recent college graduates. The other 4 percent were in jobs that were generally unrelated to their major and a degree was not required to enter them. Two percent were retail trade sales workers, and 2 percent were service workers—mostly police officers.

Graduate Study

The following tabulation shows the graduate school status of business and management (except accounting) graduates.

Enrolled	17 percent
Full time	8
Working toward advanced degree	13
Field	
Law	3
Business and management	8
Other fields	2

Chemistry

Labor Force Status

The following tabulation summarizes the labor force status of chemistry graduates.

In labor force	70 percent
Employed full time	54
Employed part time	14
Unemployed	2
Not in labor force	30

Among all chemistry graduates, 17 percent were not in the labor force because they were in school, 11 percent were in the military (a surprisingly high percentage), and 2 percent had other reasons. Most working part time were students.

Occupations of Employed Graduates

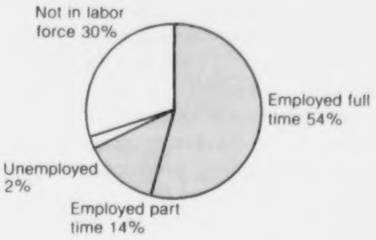
Occupations generally requiring a degree for entry. Eighty-five percent of the employed graduates were in professional, managerial, and nonretail sales occupations.

Fifty-eight percent were in chemistry-related jobs. Twenty-four percent were engineering and science technicians—almost all of whom were chemistry technicians. Twelve percent were chemists; 2 percent were manufacturers' sales workers selling chemistry-related products; and 2 percent were high school physical science (which includes chemistry) teachers. Eighteen percent were teachers and researchers in colleges and universities, almost all part time, probably employed graduate students.

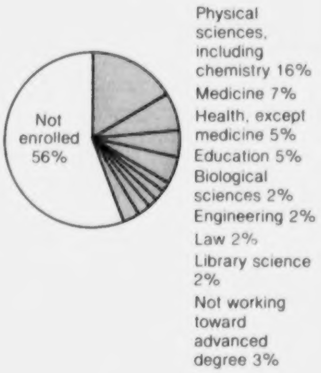
Twenty-seven percent were in jobs in which their work was not related to their major. Ten percent were engineers, not elsewhere classified, who probably qualified for their jobs, at least in part, because of their chemistry background. Seventeen percent were in a number of other occupations, including librarian, manager in transportation service, nonretail sales worker, recreation worker, therapist, and vocational and education counselor.

Here's What 1976-77 Graduates in **Chemistry** did in 1978

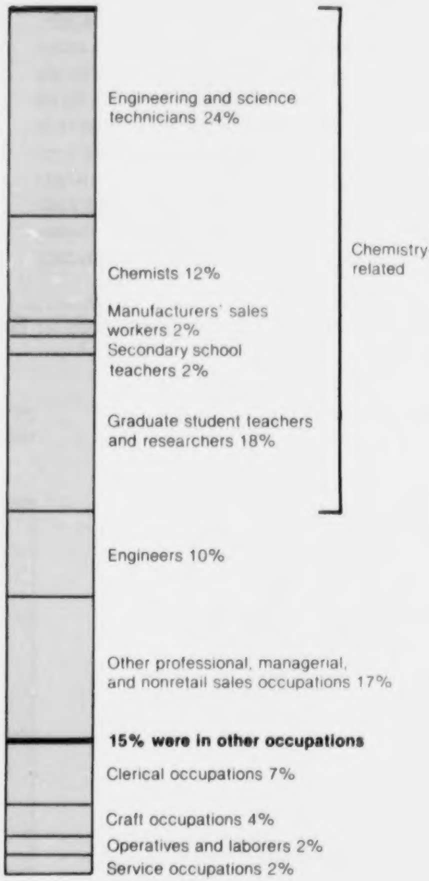
68% were working



44% were in graduate school



85% of those working were in jobs generally requiring a degree

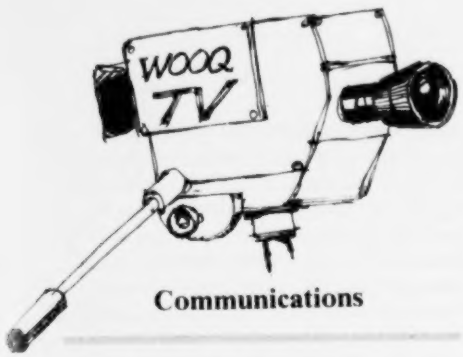


Occupations not generally requiring a degree for entry. Fifteen percent of the employed graduates were in occupations that do not usually require a college degree. Seven percent were clerical workers; 4 percent were craft workers; 2 percent were service workers; and 2 percent were operatives and laborers. All of the craft workers were blue-collar worker supervisors who were doing work related to their major in jobs requiring a degree for entry. Most were probably in trainee positions for recent college graduates. None of the others was in a job requiring a degree or doing related work. They probably were underemployed. Some took these jobs primarily to earn money while in school; others could not find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of chemistry graduates.

Enrolled	44 percent
Full time	37
Working toward advanced degree	41
Field	
Physical sciences, including chemistry	16
Medicine	7
Health except medicine	5
Education	5
Biological sciences	2
Engineering	2
Law	2
Library science	2

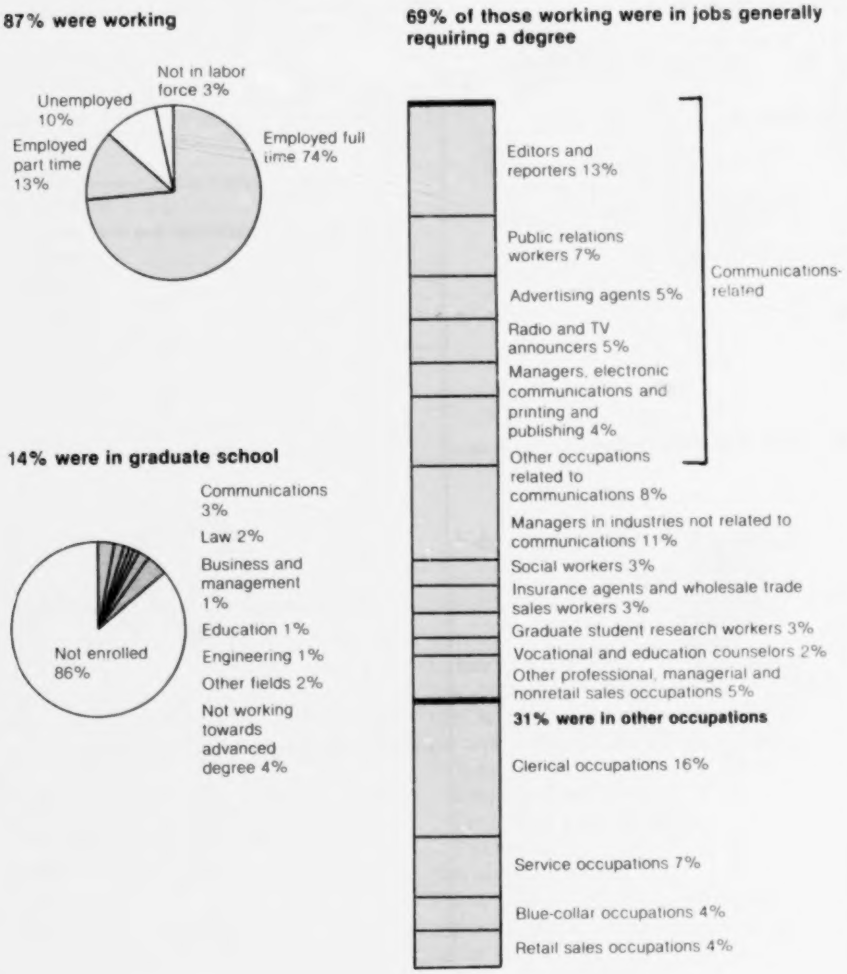


Communications

Labor Force Status
The following tabulation summarizes the labor force status of communications graduates.

In labor force	97 percent
Employed full time	74
Employed part time	13
Unemployed	10
Not in labor force	3

Here's What 1976-77 Graduates in **Communications** did in 1978



Occupations of Employed Graduates
Occupations generally requiring a degree for entry. Sixty-nine percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Forty-two percent were in communications-related occupations. Almost all reported doing work closely related to their major field of study. Thirteen percent were editors and reporters—about 10 percent in newspaper publishing and 3 percent in other industries. Seven percent were public relations workers. Five percent were advertising agents, and 5 percent were radio and T.V. announcers. Four percent were managers in electronic communications and printing and publishing industries and in professional services related to communications. Eight percent were in a variety of other occupations, including artist; photographer; other writer, artist, and entertainer jobs; research worker in professional services related to communications; sales agent for newspapers and business services related to communications.

Twenty-seven percent were in other professional, managerial, and nonretail sales jobs not directly to communications. About 11 percent were managers in industries not related to communications, including restaurant managers, sales managers in retail trade, purchasing agents, bank officers, and managers in the construction, manufacturing, and business services industries. Three percent were social workers; 3 percent were insurance agents and wholesale trade sales workers; and 3 percent were graduate students employed as research workers part-time in colleges and universities. Two percent were vocational and education counselors. And 5 percent were in other occupations.

Occupations not generally requiring a degree for entry. Thirty-one percent of the employed graduates were in occupations that do not usually require a college degree. About 16 percent were in clerical jobs; the largest number were bank tellers, bookkeepers, estimators and investigators, file clerks, mail handlers, and secretaries. Seven percent were service workers, including bartenders, dishwashers, guards, and waiters. Four percent were in blue-collar jobs, and 4 percent were retail sales workers.

A few in clerical jobs reported that their work was somewhat related to their field of study and required a degree for entry, but the great majority in these jobs indicated no relationship and no need for a degree. Many said they took their job because they couldn't find a job requiring a degree. Some took it primarily to earn money while in school or because they preferred it to jobs requiring a degree.

Graduate Study
The following tabulation shows the graduate school status of communications graduates.

Enrolled	14 percent
Full time	7
Working toward advanced degree	10
Field	
Communications	3
Law	2
Business and management	1
Education	1
Engineering	1
Other fields	2

Economics

Labor Force Status

The following tabulation summarizes the labor force status of economics graduates.

In labor force	79 percent
Employed full time	59
Employed part time	13
Unemployed	7
Not in labor force	21

Among all economics graduates, 9 percent worked part time because they were in school, and 15 percent were not in the labor force because they were in school. Six percent gave other reasons for not being in the labor force.

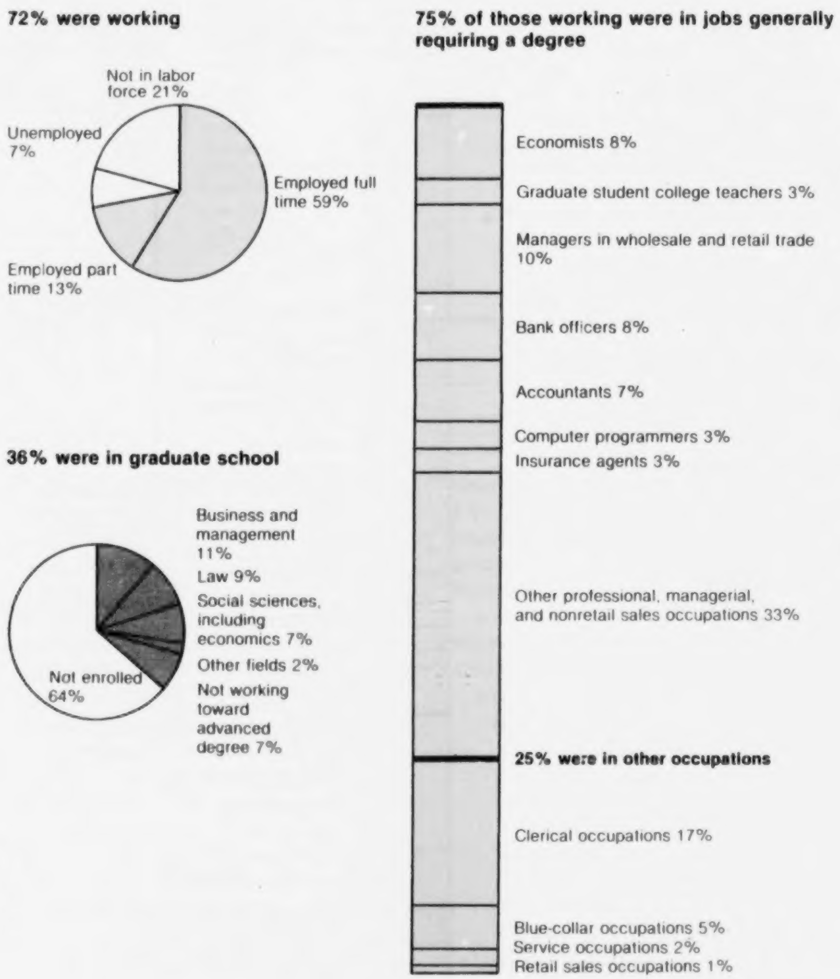
Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Seventy-five percent of the employed graduates were in professional, managerial, and nonretail sales occupations. Eight percent were economists. This relatively low percent is understandable, since for most economist jobs an advanced degree is required for entry. Another three percent were graduate students teaching economics part time in colleges and universities.

Fifty-six percent were in other jobs, mostly business related, whose work was closely or somewhat related to their major. Ten percent were managers in wholesale and retail trade, 8 percent were bank officers, 7 percent were accountants, and 3 percent each were computer programmers and insurance agents. Twenty-five percent were in a number of other occupations, including business services sales worker, credit manager, health administrator, manager in business services, manager in welfare services, manufacturers' sales worker, office manager, public relations worker, recreation worker, research worker in law firm, restaurant manager, and urban planner.

About 8 percent were in occupations in which the work was not at all related to their major, including archivist, athlete, painter and sculptor, and teacher other than school or college teacher.

Here's What 1976-77 Graduates in **Economics** did in 1978



Occupations not generally requiring a degree for entry. Twenty-five percent of the employed graduates were in occupations that do not usually require a college degree. Seventeen percent were clerical workers. Three percent (who were expediters and production controllers or estimators and investigators) were doing work somewhat related to their major in jobs in which a degree was required to enter. Others were clerical supervisors, collection workers, insurance adjusters, secretaries, and statistical clerks—all doing work somewhat related to their major but in jobs not requiring a degree for entry. Five percent were blue-collar workers, and 3 percent were retail sales workers and service workers.

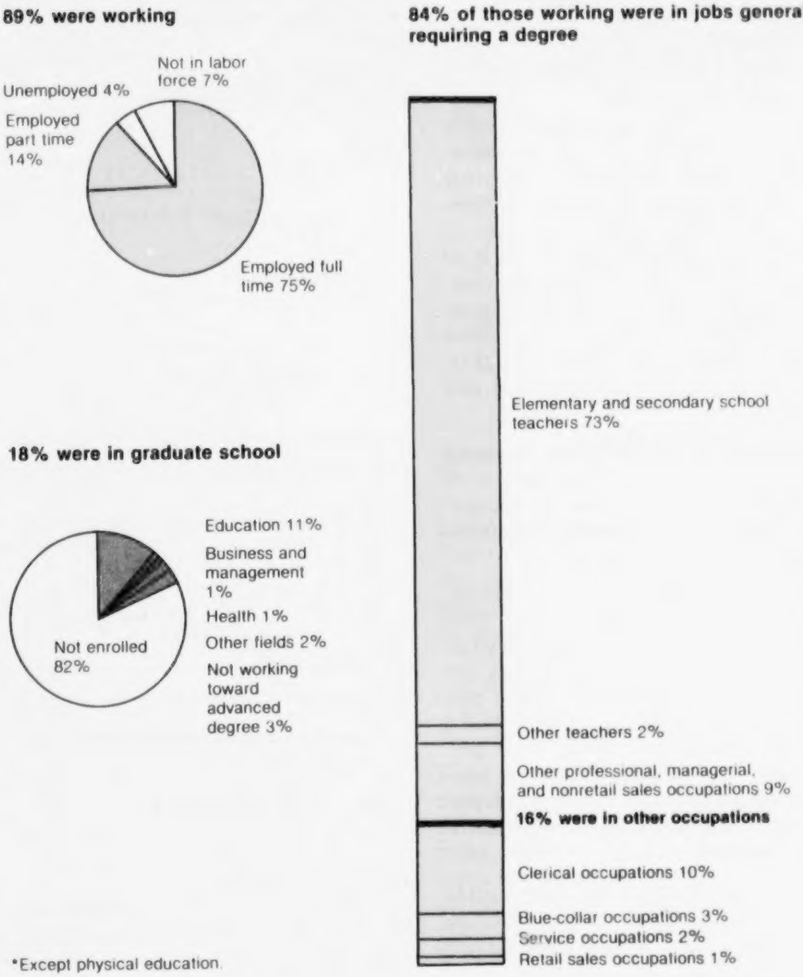
Most graduates in jobs which did not require a degree for entry took them primarily to earn money while in school.

Graduate Study

The following tabulation shows the graduate school status of economics graduates.

Enrolled	36 percent
Full time	27
Working toward advanced degree	29
Field	
Business and management	11
Law	9
Social sciences, including economics	7
Other fields	2

Here's What 1976-77 Graduates in **Education*** did in 1978



*Except physical education.

Education, Except Physical Education

Labor Force Status

The following tabulation summarizes the labor force status of education (except physical education) graduates.

In labor force	93 percent
Employed full time	75
Employed part time	14
Unemployed	4
Not in labor force	7

Three percent of all education (except physical education) graduates were not in the labor force because of family responsibilities, 2 percent were in school, and 2 percent had other reasons.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Eighty-four percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Seventy-three percent were elementary and secondary school teachers—45 percent preschool and elementary, 18 percent secondary, and 10 percent at both levels. (Eleven percent of the employed graduates were part-time teachers, and 6 percent were part-times because they could not find satisfactory full-time work). Almost all were doing work closely related to their major. Two percent were other teachers—1 percent were college and university teachers (mostly graduate students working part time), and 1 percent were adult education and other teachers.

Nine percent were in a great number of other occupations, such as the following: Bank officer, engineer, engineering and science technician, health administrator, insurance agent, manager in manufacturing industries, manager in wholesale and retail trade, manufacturers' sales worker, personnel worker, public relations worker, recreation worker, retail trade sales manager, school administrator, social worker, and therapist.

Occupations not generally requiring a degree for entry. Sixteen percent of the employed graduates were in occupations that do not usually require a degree.

Ten percent were clerical workers. Two percent were teacher aides who reported doing work closely related to their major but that a degree was not needed to obtain their job. Three percent were typists and secretaries, and 1 percent were bookkeepers. Four percent were in a number of other occupations, including bank teller, bookkeeper, estimator and investigator, and insurance adjuster.

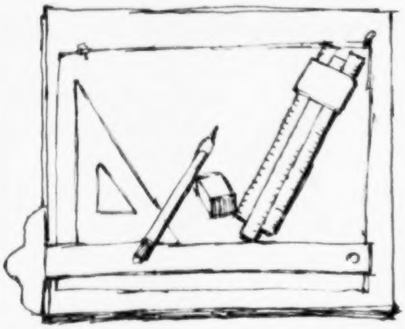
Three percent were blue-collar workers, some doing work related to their major. Two percent were service workers—about half of these were cooks, dishwashers, and waiters; and about half were child care workers and nursing aides. One percent were retail sales workers.

For few of these jobs was a degree required for entry. Most in these jobs were underemployed. About 17 percent of the education graduates employed in these occupational groups were enrolled for an advanced degree, and a substantial number of the graduates said they took a job not requiring a degree primarily to earn money while in school. Some in these jobs said they preferred their jobs to ones requiring a degree. Many others, however, were in these jobs because they could not find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of education (except physical education) graduates.

Enrolled	18 percent
Full time	6
Working toward advanced degree	15
Field	
Education	11
Business and management	1
Health	1
Other fields	2



Engineering

Labor Force Status

The following tabulation summarizes the labor force status of engineering graduates.

In labor force	91 percent
Employed full time	83
Employed part time	3
Unemployed	5
Not in labor force	9

More than half of the graduates not in the labor force were in school.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Eighty-eight percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Sixty-eight percent were engineers; about 73 percent of them said their work was closely related to their major field of study, 26 percent said it was somewhat related, and 1 percent said it was not related. The following tabulation shows the industries the engineers worked in:

Industry	Percentage of engineers employed
Manufacturing	47
Electrical machinery	13
Machinery except electrical	7
Other	27
Construction	15
Engineering and architectural services	15
Utilities and sanitary services	9
Mining and petroleum extraction	4
Public administration	3
Other industries	7

Twenty percent of the employed graduates were in other professional, managerial, and nonretail sales jobs. More than half in these jobs said their work was closely related to their major field of study; for the rest, it was somewhat related. Most said that a degree was required for entry.

Four percent were engineering technicians. (Ten percent of electrical engineering graduates were technicians.) Even though a degree is not an entry requirement for most engineering technician jobs, most of the technicians reported that a degree was required to obtain their jobs.

Four percent were managers in manufacturing industries. Three percent were computer specialists. Two percent were sales workers in manufacturing industries, and 2 percent were managers in the construction industry. Five percent were in a variety of other occupations—college teacher and research worker, designer, economist, public administration (government) official, purchasing agent, and other manager.

Occupations not generally requiring a degree for entry. About 12 percent of the employed graduates were in clerical, blue-collar, and service jobs. The vast majority of jobs in these groups do not require a degree for entry. However, more than a third of the engineering graduates who were in occupations in these categories reported that a degree was required to obtain their job.

Five percent of the employed graduates were clerical workers—three quarters of whom were estimators and investigators in construction and manufacturing industries, jobs likely to be trainee positions for recently hired graduates. Five percent were craft workers, and 2 percent were laborers, operatives, and service workers. One percent of the employed graduates were blue-collar worker supervisors (who are classified as craft workers), another occupation that is probably a trainee job for recent college graduates.

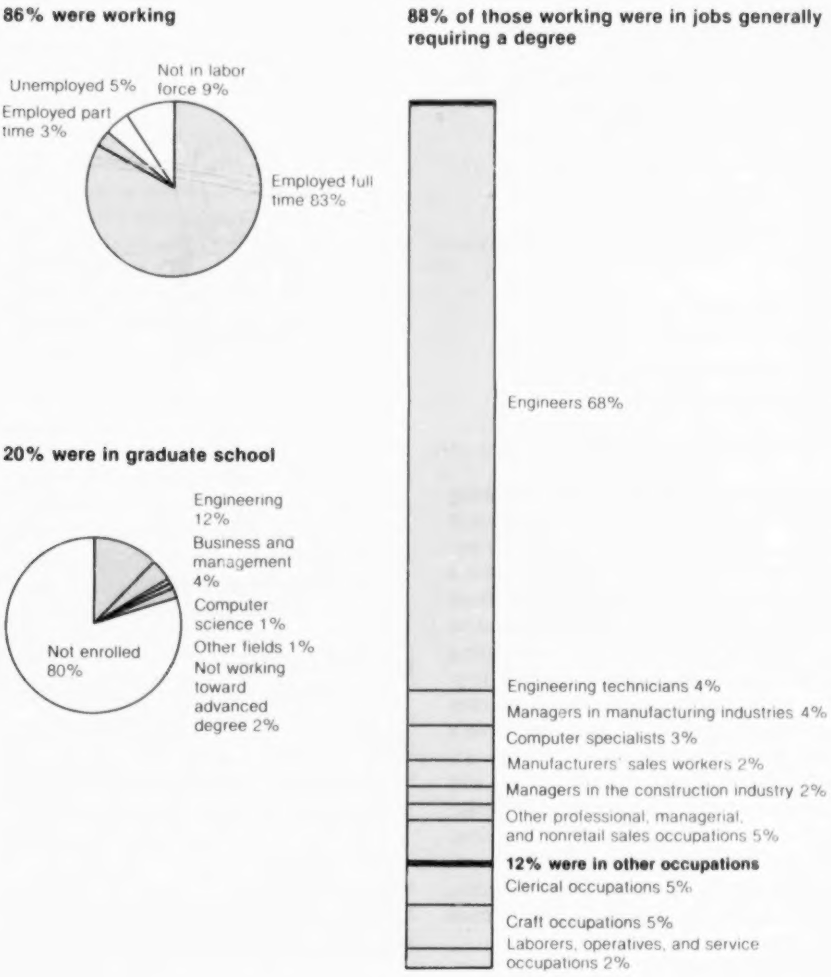
Of those who took jobs not requiring a degree, some did so to earn money while in school, some because the experience was good. In contrast to graduates in many other fields, hardly any engineering graduates reported they were unable to find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of engineering graduates.

Enrolled	20 percent
Full time	12
Working toward advanced degree	18
Field	
Engineering	12
Business and management	4
Computer science	1
Other fields	1

Here's What 1976-77 Graduates in **Engineering** did in 1978


86% were working

88% of those working were in jobs generally requiring a degree

20% were in graduate school

English

Labor Force Status

The following tabulation summarizes the labor force status of English graduates.

In labor force	80 percent
Employed full time	54
Employed part time	15
Unemployed	11
Not in labor force	20

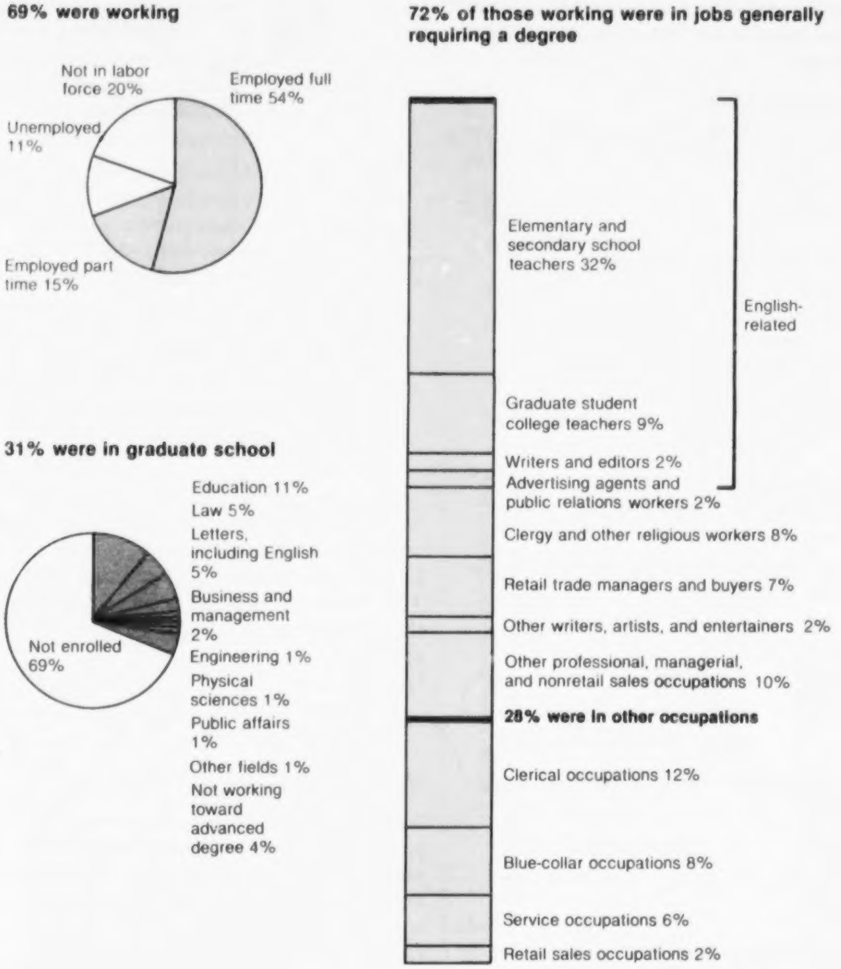
Eight percent of the graduates worked part time because they were in school, 2 percent preferred part-time employment, and 5 percent preferred part-time work for other reasons. Eleven percent of the graduates gave school as their reason for not being in the labor force, 6 percent had family responsibilities, and 3 percent had other reasons.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Seventy-two percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Forty-five percent were in occupations related to English, and all graduates in these occupations said their work was closely related to their major. Thirty-two percent were elementary and secondary school teachers. Most were secondary school English teachers; some were reading and social science teachers. Nine percent were graduate students teaching part-time in colleges and universities. Two percent were newspaper

Here's What 1976-77 Graduates in **English** did in 1978



writers and editors; and 2 percent were advertising agents and public relations workers.

Twenty-seven percent were in occupations generally only somewhat or not related to their major. Eight percent were clergy and other religious workers; 7 percent were retail store managers, retail sales managers, and buyers; and 2 percent were in various writer, artist, and entertainer positions. Ten percent were in a variety of other occupations, including accountant, college and university administrator, manager in manufacturing, real estate agent, sales manager (except retail trade), vocational and education counselor, and wholesale trade sales worker.

Occupations not generally requiring a degree for entry. Twenty-eight percent of the employed graduates were in occupations that do not usually require a college degree. Virtually none of those surveyed said a degree was required to obtain their jobs; very few were doing work related to English. Twelve percent were clerical workers—3 percent were secretaries and typists, others were bank tellers, bookkeepers, library attendants, proofreaders, shipping and receiving clerks, and statistical clerks. Eight percent were blue-collar workers. Six percent were service workers, including cooks and chefs, health aides, and waiters. Two percent were retail sales workers.

Most in these jobs probably were underemployed. Some in these jobs were enrolled in graduate school, and a few said they took their job primarily to earn money while in school. Others said they took these jobs because they preferred them to ones requiring a degree or couldn't find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of English graduates.

Enrolled	31 percent
Full time	18
Working toward advanced degree	27
Field	
Education	11
Law	5
Letters, including English	5
Business and management	2
Engineering	1
Physical sciences	1
Public affairs	1

History

Labor Force Status

The following tabulation summarizes the labor force status of history graduates.

In labor force	75 percent
Employed full time	55
Employed part time	16
Unemployed	4
Not in labor force	25

Most of the part-timers were in school or could not find full-time work. Among all graduates, 11 percent were not in the labor force because they were in school, 7 percent did not want to work, 3 percent were unpaid workers in a family business, and 4 percent were in the military.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Fifty-four percent of the employed graduates were in professional, managerial, and nonretail sales jobs. None were historians, which is understandable since an advanced degree is required to enter most jobs in the occupation.

Elementary and secondary school teaching was the largest single occupation entered, with 14 percent of the employed graduates. Most were secondary school history or other social sciences teachers whose work was closely related to their major. Four percent were employed graduate students, teaching or doing research related to their history major in colleges and universities part-time.

Thirty-six percent were in a variety of other college-level jobs that were only somewhat or not at all related to their major. Four percent were bank officers, and 3 percent were newspaper editors and reporters. The following occupations were also mentioned by the history graduates surveyed: Bowling alley manager, business services sales worker, chemist, college and university administrator, economist, elementary and secondary school administrator, engineering and science technician, insurance agent, manufacturers' sales worker, personnel worker, public relations worker, real estate sales worker, religious worker, restaurant manager, retail trade manager and buyer, and social worker.

Occupations not generally requiring a degree for entry. Forty-six percent of the employed graduates were in jobs that do not usually require a college degree. Very few in these jobs said they were doing work at all related to their major, and very few needed a degree to obtain their job.

Twenty-two percent were clerical workers—4 percent were bank tellers, and others were clerical supervisors, file clerks, library attendants, postal clerks, receptionists, secretaries, statistical clerks, teacher aides, and typists.

Six percent were retail sales workers; 6 percent were operatives; and 6 percent were service workers, including child care workers, flight attendants, health aides, waiters, and waiters' assistants. Four percent were craft workers; and 2 percent were laborers. Most people in these jobs were underemployed.

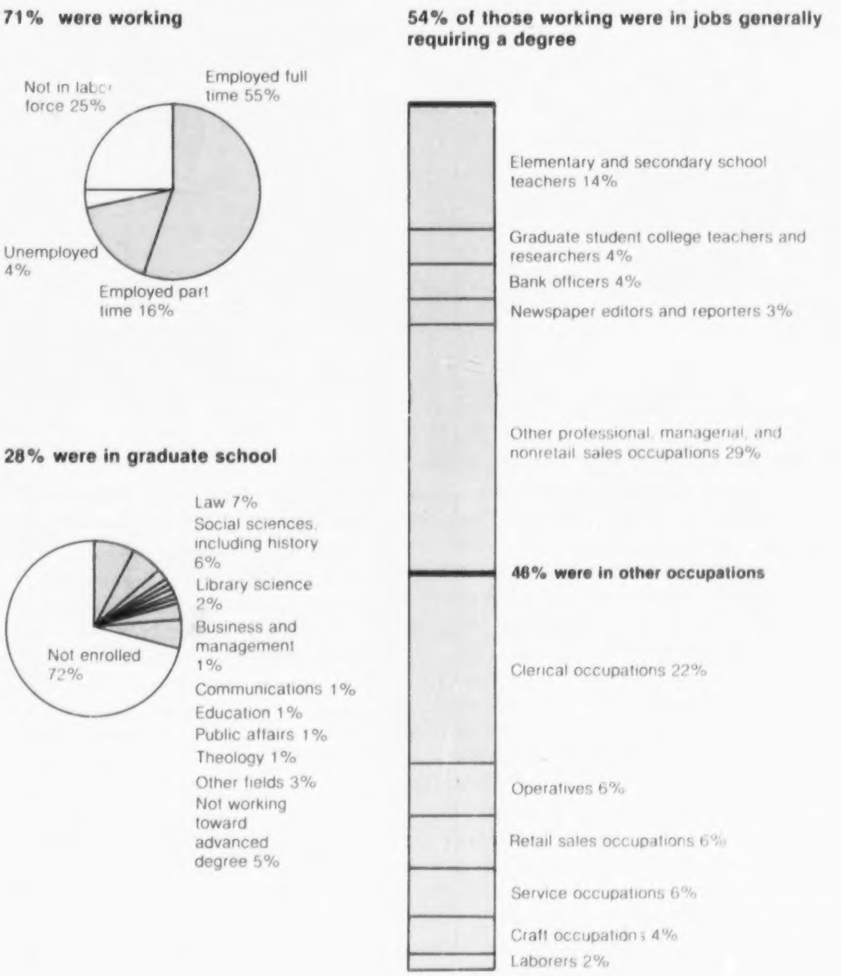
About a quarter of all social science (which includes history) graduates in these occupational groups were enrolled for an advanced degree; some history graduates said they took these jobs not requiring a degree primarily to earn money while in school. Most in these jobs, however, were not in school and were in them because they could not find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of history graduates.

Enrolled	28 percent
Full time	17
Working toward advanced degree	23
Field	
Law	7
Social sciences, including history	6
Library science	2
Business and management	1
Communications	1
Education	1
Public affairs	1
Theology	1
Other fields	3

Here's What 1976-77 Graduates in **History** did in 1978



71% were working

28% were in graduate school

54% of those working were in jobs generally requiring a degree

Home Economics

Labor Force Status

The following tabulation summarizes the labor force status of home economics graduates.

In labor force	82 percent
Employed full time	67
Employed part time	11
Unemployed	4
Not in labor force	18

Among all home economics graduates, 7 percent worked part time because they could not find full-time work, 2 percent were in school, and 2 percent preferred part-time work. Also among all the graduates, 8 percent were not in the labor force because of family responsibilities, 3 percent were in school, and 7 percent had other reasons.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Sixty-one percent of the employed graduates were in professional, managerial, and nonretail sales occupations.

Fifty-six percent were in occupations related to home economics; almost all reported doing work closely related to their major. Twenty-one percent were elementary and secondary school teachers of home economics and related subjects. Not quite half of these worked full time and the rest were part-timers. Most were part-timers because they couldn't find satisfactory full-time work.

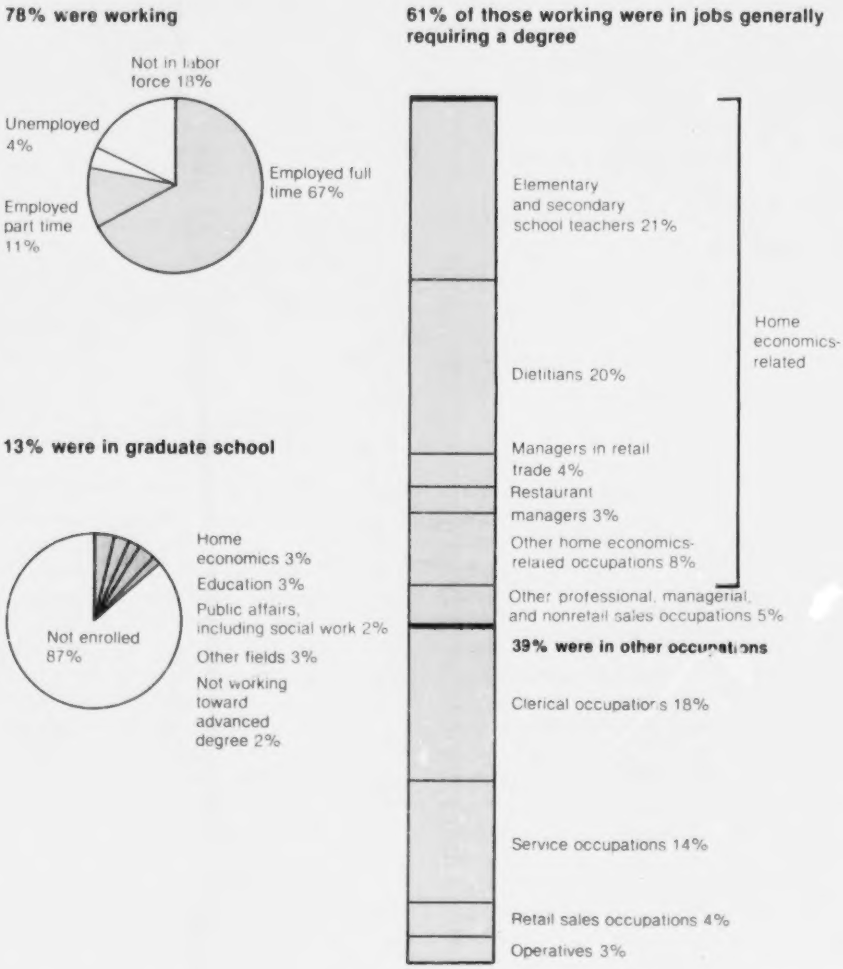
Twenty percent were dietitians, 4 percent were managers in retail trade, 3 percent were restaurant managers, and a few were in the following occupations: College and university teacher of trade subjects (which includes fashion design), designer, elementary and secondary school administrator, home management advisor, sales manager, and social worker.

Five percent were in occupations not related to home economics, including coach and physical education teacher, engineering technician, librarian, painter and purchasing agent.

Occupations not generally requiring a degree for entry. Thirty-nine percent of the employed graduates were in other occupations, virtually none of which require a degree for entry; only a few of these graduates were doing work at all related to home economics. Eighteen percent were clerical workers—5 percent were secretaries; 3 percent were bookkeepers; and others were insurance adjusters, stock clerks, typists, and vehicle dispatchers. Fourteen percent were service workers—4 percent, dental assistants and health aides; 3 percent, waiters; and others were child care workers, housekeepers (except private household), private household maids and servants, and recreation attendants.

Many were in these occupations because they could not find a job requiring a degree; others preferred them to ones requiring a degree or took them to earn money while in school.

Here's What 1976-77 Graduates in **Home Economics** did in 1978

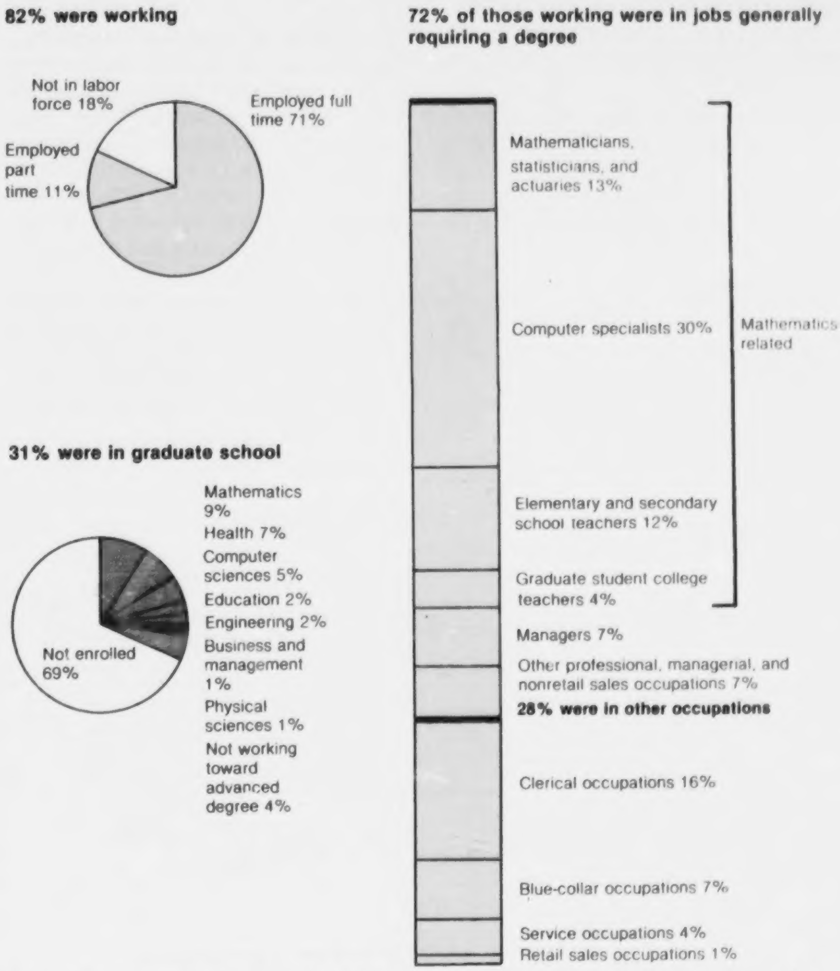


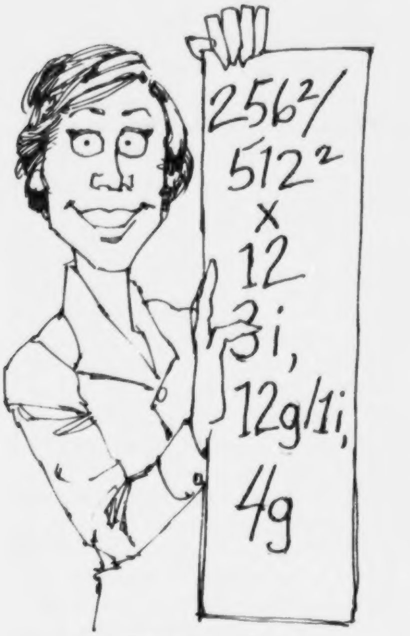
Graduate Study

The following tabulation shows the graduate school status of home economics graduates.

Enrolled	13 percent
Full time	7
Working toward advanced degree	11
Field	
Home economics	3
Education	3
Public affairs, including social work	2
Other fields	3

Here's What 1976-77 Graduates in **Mathematics** did in 1978





Mathematics

Labor Force Status

The following tabulation summarizes the labor force status of mathematics graduates.

In labor force	82 percent
Employed full time	71
Employed part time	11
Unemployed	0
Not in labor force	18

Most of those not in the labor force were in school. Four percent of all mathematics graduates were in the military.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Seventy-two percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Fifty-nine percent were in mathematics-related occupations. Thirty percent were computer specialists—programmers, systems analysts, and other computer specialists. About half reported that their work was closely related to their major field of study, and half reported that it was somewhat related. Thirteen percent were mathematicians, statisticians or actuaries, all doing work closely related to their major. Twelve percent were elementary and secondary school teachers. Most taught mathematics. Four percent were graduate students teaching mathematics in colleges and universities part-time.

Thirteen percent were in occupations not directly related to mathematics. However, many said there was some relationship between their work and their major. Seven percent were managers, including bank officers, sales managers outside of retail trade, and other managers. Another 6 percent were in a variety of other occupations, including accountant, economist, engineering and science technician, and nonretail sales worker.

Occupations not generally requiring a degree for entry. Twenty-eight percent of the employed graduates were in jobs that do not usually require a college degree. Most of these were not related to mathematics, and only a few graduates surveyed said their job required a degree for entry. Sixteen percent were clerical workers, mostly bank tellers, computer operators, and estimators and investigators. Seven percent were blue-collar workers; 4 percent were service workers; and 1 percent were retail sales workers.

Most people in these jobs probably were underemployed. Although some were in these jobs primarily to earn money while in school, others took them because they couldn't find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of mathematics graduates.

Enrolled	31 percent
Full time	20
Working toward advanced degree	27
Field	
Mathematics	9
Health	7
Computer sciences	5
Education	2
Engineering	2
Business and management	1
Physical sciences	1

Nursing

Labor Force Status

The following tabulation summarizes the labor force status of nursing graduates.

In labor force	94 percent
Employed full time	84
Employed part time	8
Unemployed	2
Not in labor force	6

Most of those working part time preferred part time work. Among all nursing graduates, 3 percent were not in the labor force because of school and 3 percent had family responsibilities or other reasons.

Occupations of Employed Graduates

Virtually all employed graduates were in professional and managerial occupations. Ninety-two percent were registered nurses—92 percent of them were in hospitals; 3 percent in health facilities such as laboratories, clinics, and government health agencies; 1 percent in offices of physicians; and 4 percent in other industries.

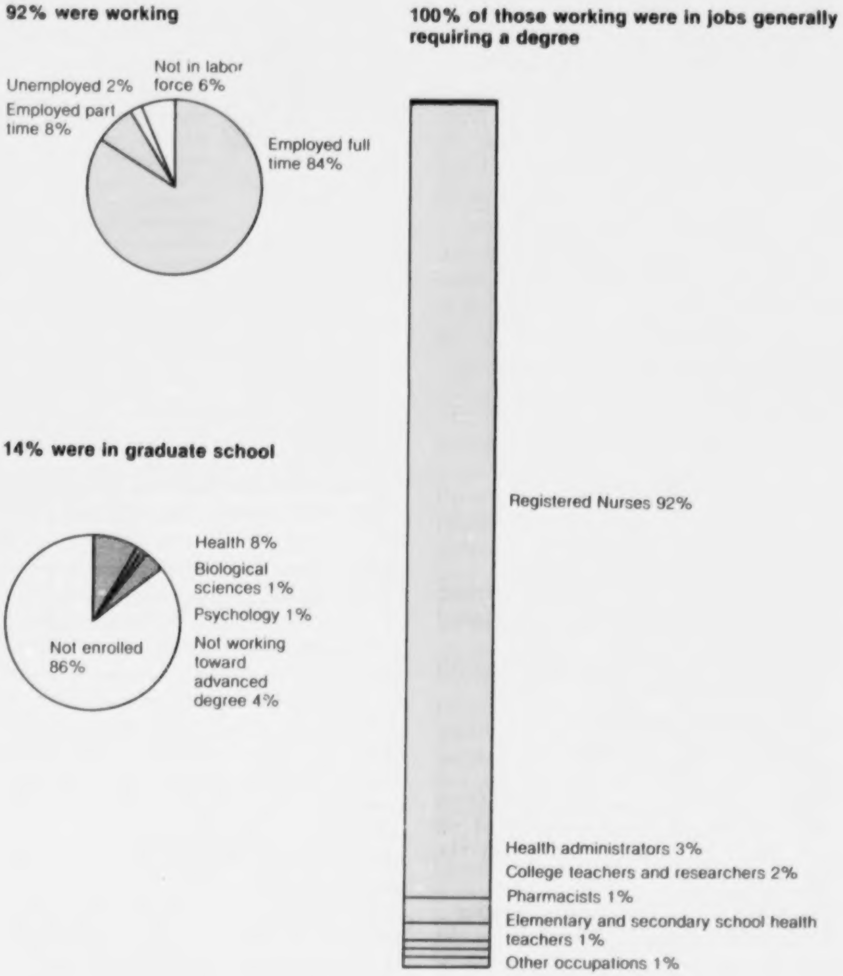
Eight percent were in other occupations, all doing work closely related to their major. Three percent were health administrators; 2 percent were teachers and researchers in colleges and universities; 1 percent were pharmacists (who must also have had previous education which enabled them to obtain a license to practice pharmacy); and 1 percent were in occupations that do not usually require a degree for entry.

Graduate Study

The following tabulation shows the graduate school status of nursing graduates.

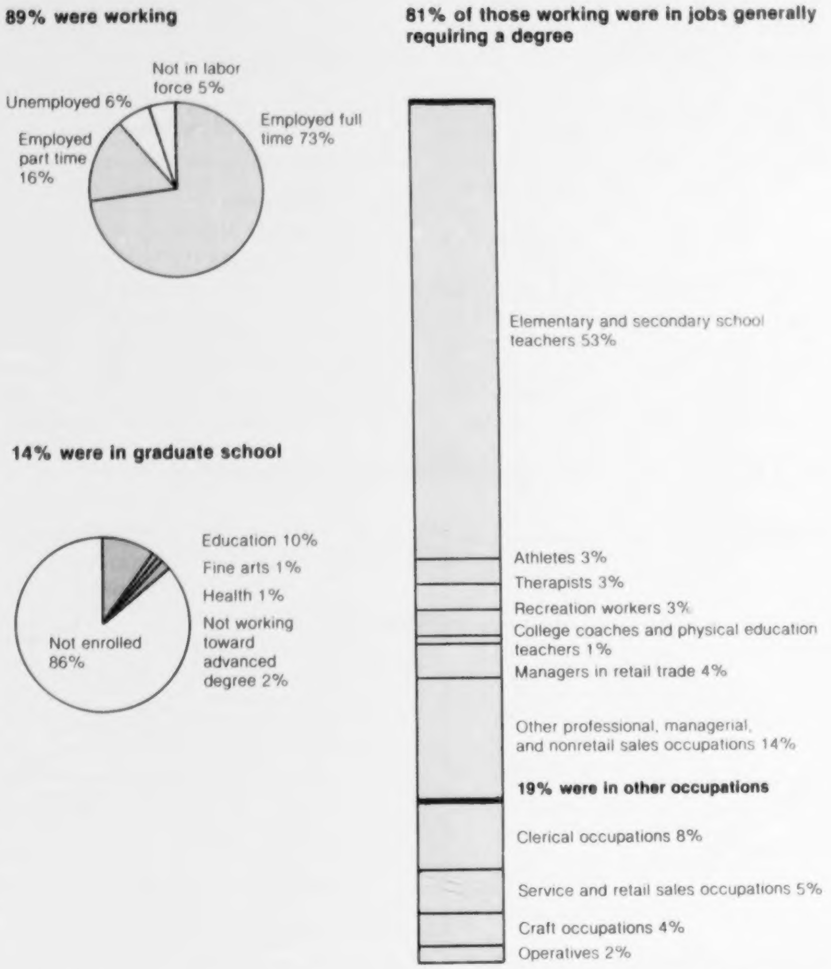
Enrolled	14 percent
Full time	8
Working toward advanced degree	10
Field	
Health	8
Biological sciences	1
Psychology	1

Here's What 1976-77 Graduates in **Nursing** did in 1978



Physical Education

Here's What 1976-77 Graduates in **Physical Education** did in 1978



Labor Force Status

The following tabulation summarizes the labor force status of physical education graduates.

In labor force	95 percent
Employed full time	73
Employed part time	16
Unemployed	6
Not in labor force	5

Among all physical education graduates, 7 percent were working part time because they could not find full time work and 5 percent worked less than full time because they were in school.

Occupations of Employed Graduates

Occupation generally requiring a degree for entry. Eighty-one percent of employed physical education graduates were in professional, managerial, and nonretail sales jobs.

Fifty-three percent were school teachers—30 percent secondary, 13 percent elementary, and 10 percent at both levels. Most taught physical education; many taught health; and some taught special education, social sciences, physical sciences, or one of several other subjects.

Ten percent were in other occupations closely related to their major. Three percent each were athletes, therapists, and recreation workers; and 1 percent were college coaches and physical education teachers.

Eighteen percent were in occupations only somewhat or not at all related to their major. Four percent were managers in retail trade; others were accountants, foresters and conservationists, health administrators, insurance agents, manufacturers' sales workers, personnel workers, restaurant managers, social workers, and vocational and education counselors.

Occupations not generally requiring a degree for entry. Nineteen percent of the employed graduates were in occupations for which a degree generally is not required. Eight percent were clerical workers—secretaries and receptionists, collection workers, stock clerks, teacher aides, and others. Five percent were service and retail sales workers, including child care workers, dishwashers, flight attendants, police officers, recreation attendants, and wiaters. Two percent were operatives.

Most were in these jobs because they could not find ones requiring a degree; some however, took them primarily to earn money while in school, or because they preferred them to ones requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of physical education graduates.

Enrolled	14 percent
Full time	7
Working toward advanced degree	12
Field	
Education	10
Fine arts	1
Health	1

Political Science

Labor Force Status
The following tabulation summarizes the labor force status of political science graduates.

In labor force	65 percent
Employed full time	47
Employed part time	10
Unemployed	8
Not in labor force	35

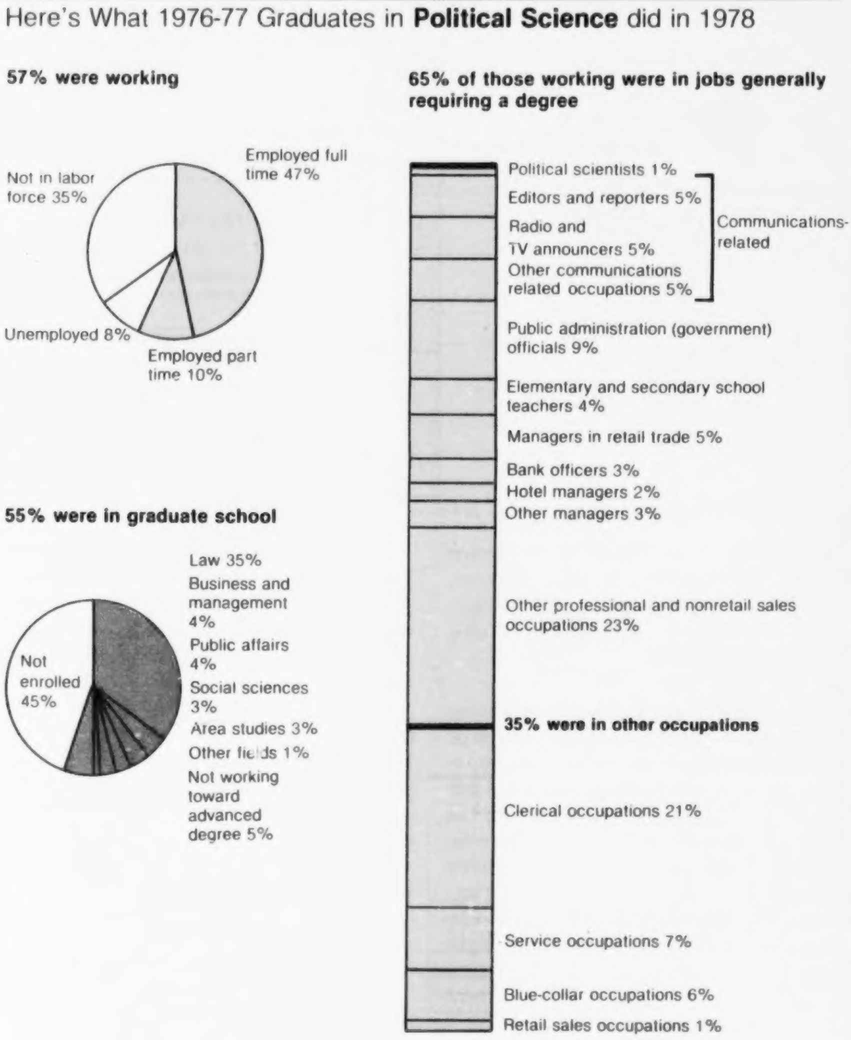
Most of those working part time did so because they were in school. School was also the major reason for not being in the labor force, it being the explanation given by 27 percent of the graduates. Three percent of the graduates did not want to work, and 5 percent had a variety of other reasons for not being in the labor force.

Occupations of Employed Graduates
Occupations generally requiring a degree for entry. Sixty-five percent of the employed graduates were in professional, managerial, and nonretail sales jobs. Only 1 percent were political scientists. This is understandable, since an advanced degree is usually required to enter the occupation. However, about 15 percent were in communications-related occupations. Five percent were editors and reporters in printing and publishing except newspapers—primarily periodicals and books. Five percent were radio and television announcers; 2 percent were public relations workers; 2 percent were managers and sales workers in professional services related to communications, and 1 percent were writers. Most in them said their work was somewhat related to their major, probably because much of the subject matter of communications is political in nature.

Nine percent were public administrators (government) officials or managers; all in these jobs said their work was closely or somewhat related to their major. Four percent were elementary and secondary school teachers—mostly secondary school social science teachers who indicated their work was related to their major.

Thirteen percent were other managers and administrators, most doing work unrelated to their major. Five percent were managers in retail trade, 3 percent were bank officers, 2 percent were hotel managers, and 3 percent were in a number of other occupations.

Twenty-three percent were in a variety of other professional and sales jobs. Respondents reported the following occupations: Actuary, health technician, health therapist, insurance agent, personnel worker, programmer, recreation worker, research worker in business



management and consultant services, research worker in legal services, social worker, transportation services sales representative, and vocational and education counselor.

Occupations not generally requiring a degree for entry. Thirty-five percent of the employed graduates were in occupations that usually do not require a college degree. In fact, very few in these jobs reported that a degree was required to obtain their job, and few said there was any relationship between their work and their major.

Twenty-one percent were clerical workers, including bank tellers, bookkeepers, clerical supervisors, file clerks, secretaries, shipping and receiving clerks, and typists. Seven percent were service workers—5 percent were food service workers and housekeepers; one percent were police officers. Six percent were blue-collar workers—craft workers, operatives, and laborers. One percent were retail sales workers.

Most people in these jobs probably were underemployed. About a quarter of all social science (which includes political science) graduates in these occupational groups were enrolled for an advanced degree; and a substantial proportion indicated they took a job not requiring a degree primarily to earn money while in school. Some, however, took these jobs because they couldn't find jobs requiring a college degree.

Graduate Study

The following tabulation shows the graduate school status of political science graduates.

Enrolled	55 percent
Full time	43
Working toward advanced degree	50
Field	
Law	35
Business and management	4
Public affairs	4
Area studies	3
Social sciences	3
Other fields	1

Psychology

Labor Force Status

The following tabulation summarizes the labor force status of psychology graduates.

In labor force	79 percent
Employed full time	54
Employed part time	21
Unemployed	4
Not in labor force	21

Most of the part-timers were in school, had household responsibilities, or preferred part-time work for other reasons. Among all psychology graduates, 12 percent were not in the labor force because they were in school, 3 percent had family responsibilities, and 6 percent had a variety of other reasons.

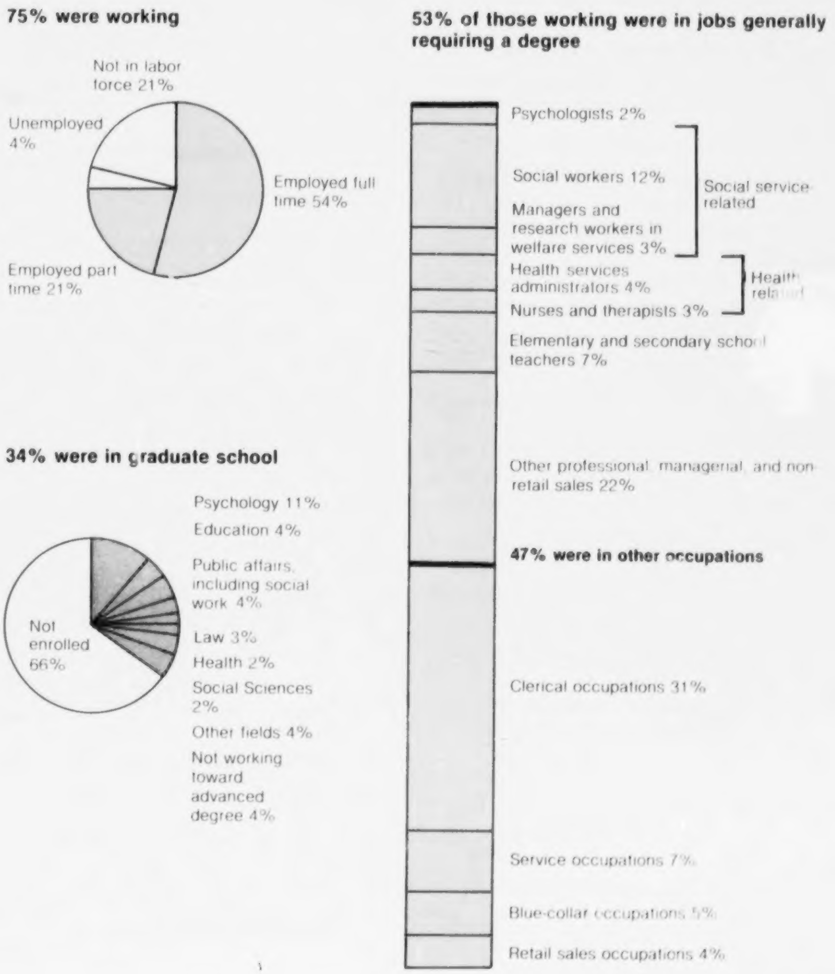
Occupations of Employed Graduates

Occupation generally requiring a degree for entry. Fifty-three percent of the employed graduates were in professional, managerial, and nonretail sales jobs.

Less than 2 percent reported being psychologists. This is not surprising, since an advanced degree is required for almost all jobs in the occupation. However, about 15 percent were in social services work: Twelve percent were social workers; another 3 percent were managers and administrators or research workers in the welfare services industry. Almost all indicated that their work was closely related to their major field of study.

About 7 percent were in health serv-

Here's What 1976-77 Graduates in **Psychology** did in 1978



ices. Four percent were health services administrators in hospitals; most reported doing work closely related to psychology. About 3 percent were registered nurses or therapists, in work they described as related to their major. The nurses must have had previous educational preparation that enabled them to meet licensing requirements to practice nursing.

Seven percent were elementary and secondary school teachers, about half of whom worked part time. Many were special education or reading teachers.

About 22 percent were in a wide variety of other occupations. Most were only somewhat or not related to psychology. The following were among the occupations mentioned by respondents: Computer specialist; personnel worker; vocational and educational counselor; engineering and science technician; manager in retail trade; public administration (government) official; college and university administrator; and insurance, real estate, securities, manufacturers' or wholesale trade sales worker.

Occupations not generally requiring a degree for entry. The remaining employed graduates, about 47 percent, were in occupations that do not usually require a college degree. And, in fact, the great majority in them reported that a degree was not required for entry, and most indicated that their work was unrelated to psychology.

Thirty-one percent were clerical workers—5 percent were secretaries, 3 percent receptionists, 2 percent insurance adjusters, 2 percent file clerks, 2 percent stock clerks, and 11 percent in other clerical occupations.

Seven percent were service workers—including nursing aides, waiters, and others. Four percent were blue-collar workers; and 4 percent were retail sales workers. Most people in these jobs were probably underemployed.

About 20 percent of psychology graduates in these occupational groups were enrolled for an advanced degree, and some said they took jobs not requiring a degree primarily to earn money while in school. Others said that the experience would be valuable or that they preferred the jobs to ones requiring a degree. However, many others could not find a job requiring a degree.

Graduate Study

The following tabulation shows the graduate school status of psychology graduates.

Enrolled	34 percent
Full time	25
Working toward advanced degree	30
Field	
Psychology	11
Education	4
Public affairs, including social work	4
Law	3
Health	2
Social sciences	2
Other fields	4

Sociology

Labor Force Status

The following tabulation summarizes the labor force status of sociology graduates.

In labor force	86 percent
Employed full time	60
Employed part time	13
Unemployed	13
Not in labor force	14

Most of the part-timers were in school; other could not find full-time work. Almost three-fourths of those not in the labor force were in school.

Occupations of Employed Graduates

Occupations generally requiring a degree for entry. Forty-eight percent of the employed graduates were in professional, managerial, and nonretail sales jobs. None were sociologists, which is understandable since an advanced degree is usually required to enter the occupation.

However, about 23 percent reported they were doing work closely related to their major. Fourteen percent were social workers. Four percent were elementary and secondary school teachers. Most said their work was closely related to their major; but few indicated teaching subjects related to sociology—most reported being mathematics or reading teachers. Two percent were public administration (government) officials, 2 percent were college and university administrators, and 1 percent were recreation workers.

Twenty-five percent were in a variety of other college-level jobs, all only somewhat or not related to their major, including economist, engineering technician, health administrator, hotel manager, legal researcher, manager in miscellaneous business services and the construction industries, manufacturers'

THE PEOPLES OF EAST ANGLIA VOL. 6
VOL. 6
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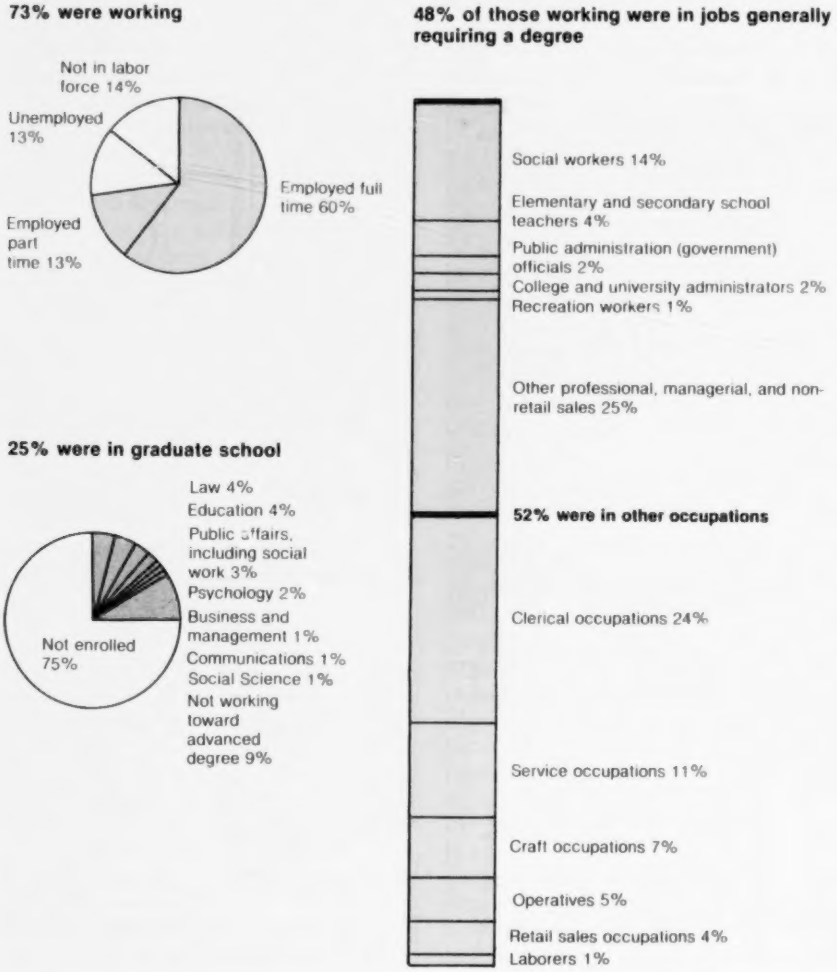
Here's What 1976-77 Graduates in **Sociology** did in 1978


73% were working

48% of those working were in jobs generally requiring a degree

25% were in graduate school

and wholesale trade sales worker, office manager, sales manager, therapist, and vocational and education counselor.

Occupations not generally requiring a degree for entry. Fifty-two percent of the employed graduates were in occupations that do not usually require a college degree. Twenty-four percent were clerical workers, including bank tellers, estimators and investigators, file clerks, library attendants, receptionists, secretaries, and typists. Eleven percent were service workers—7 percent waiters and waiters' assistants, 2 percent police officers and guards, and 1 percent child care workers. Seven percent were craft workers; 5 percent were operatives; and 1 percent were laborers. Most of the craft workers and operatives, the child care workers, and a few clerical workers indicated a close relationship between their work and their major. Some said their jobs required a degree for entry; most did not. Most people in these jobs probably were underemployed.

About a quarter of all social science (which includes sociology) graduates in these occupational groups were enrolled for an advanced degree, and some sociology graduates said they took jobs not requiring a degree primarily to earn money while in school. However, the majority in these jobs couldn't find a job requiring a degree.

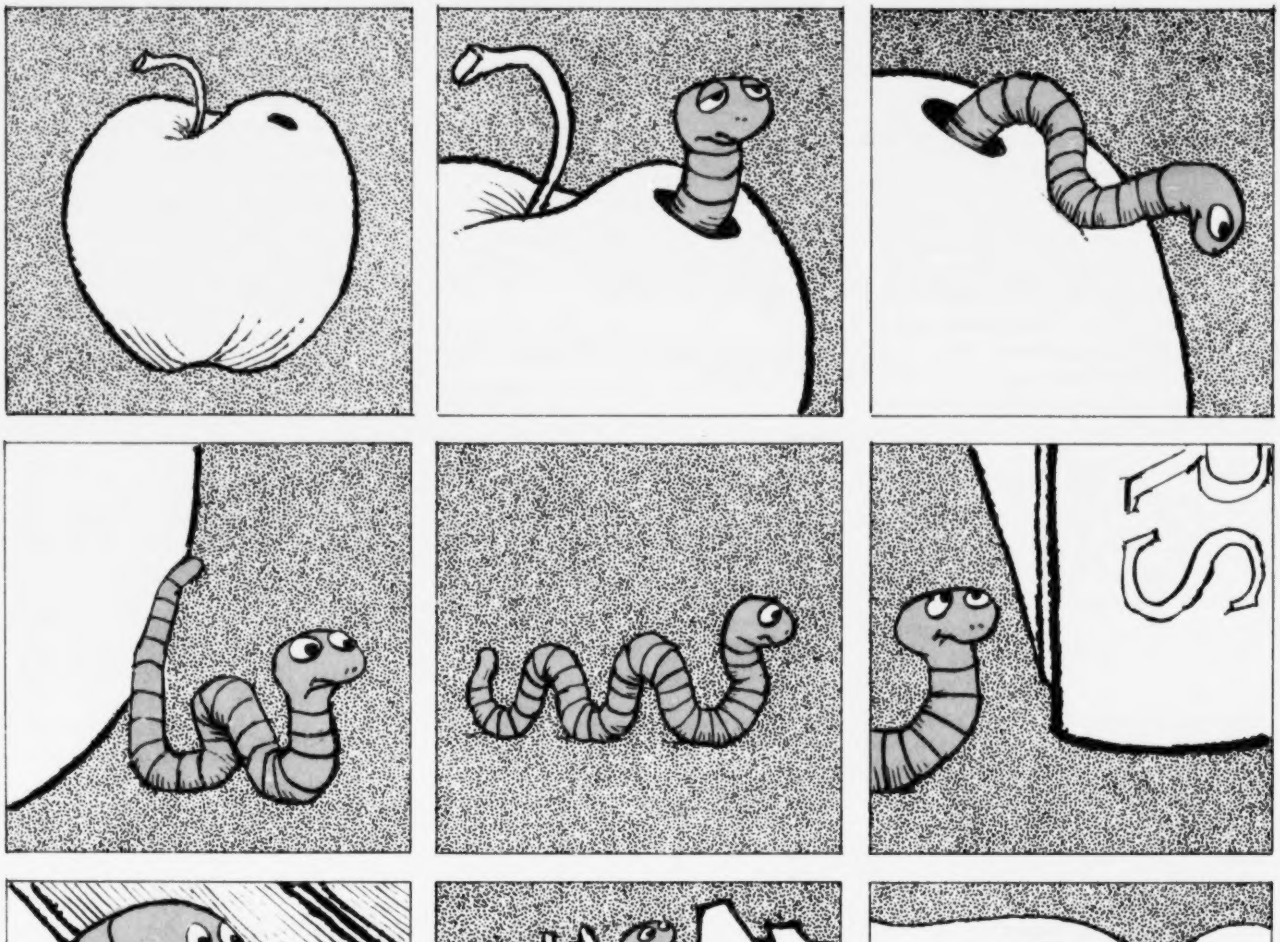
Graduate Study

The following tabulation shows the graduate school status of sociology graduates.

Enrolled	25 percent
Full time	13
Working toward advanced degree	16
Field	
Law	4
Education	4
Public affairs, including social work	3
Psychology	2
Business and management	1
Communications	1
Social science	1

CAREER INFORMATION

WHAT'S AVAILABLE IN SCHOOLS?



CAREER
OCCUPATIONAL G
JOBS in YOUR

Perplexed about the kinds of materials that should be in your career guidance program? Here's what others have.

Two books published by the U.S. Department of Labor—the *Occupational Outlook Handbook (OOH)* and the *Dictionary of Occupational Titles (DOT)*—are among the most widely available career resources in secondary schools, according to a study conducted by the Educational Testing Service.

The study, *Survey of Career Information Systems in Secondary Schools*, by Warren Chapman and Martin R. Katz, surveyed a sample of senior high schools and their students on many subjects related to career information. Included were questions on the availability of a wide range of resources, such as audiovisual materials, school arranged programs, individual counseling, and publications.

The *OOH* was the most available source of information; more than 92 percent of the schools had copies. About 83 percent of the schools had each of the next two most prevalent resources—conferences with counselors and the *DOT*. Career days, occupational handbooks for the military, vocational school directories, audio-visual material produced outside of schools, and college directories arranged by occupation were available at 70 to 75 percent of schools. These rankings related to availability of specific resources and not to their use or effectiveness.

Publications

Because publications are such an important part of career information programs, separate data were gathered on the names and types of publications frequently available in schools. The accompanying table shows the percent of schools that had each listed publication and the ranking of the publication according to its availability among all publications listed, without regard to category.

The OOH and *DOT* were by far the most commonly available bound references. Occupational handbooks for the military were also widely stocked.

Among briefs and kits, the leaders were pamphlets prepared by professional associations, pamphlets prepared by private business, and briefs prepared by Chronicle Guidance Publications, Inc. The *Occupational Outlook Quarterly* was the most widely available periodical, followed by *Career World*. College directories arranged by occupation and vocational school directories led in the "directories" category.

Following is descriptive information on some of the publications listed in the table. The material is excerpted, with abridgments, from the report.

Of the published resources [focusing on information about occupations,] the *OOH* and Hopke's *Encyclopedia of Careers* come closest to being complete. They both cover national information on all aspects of job duties, education, personal and other requirements, outlook and salary for over 350 occupations. However, if certain information is difficult to get for a particular occupation, it is sometimes omitted without comment, a practice followed by most of the publications written in paragraph form. Also, local information is absent.

Each of the three major government publications specializes. The *DOT*, 1977, although a classic in defining occupations and describing job activities in detail, does not pretend to give, as the *OOH* does, information on outlook, salaries, education, training, or possible employers. The *Guide for Occupational Exploration (GOE)*, which clusters occupations into groups with similar general duties and interests, does not define any occupations. It gives for each group a list of names with *DOT* numbers, and refers the reader to the *DOT* for descriptions of the specific occupations. Thus, while the *GOE* gives information that the *DOT* does not on personal characteristics, interests, training and licensing in general, both publications avoid the time-related questions of outlook and salary, which are covered in the *OOH*. Hence, it is only the *OOH* that must publish a new edition every two years; the *DOT* comes out much less frequently; the *GOE* has been published only once.

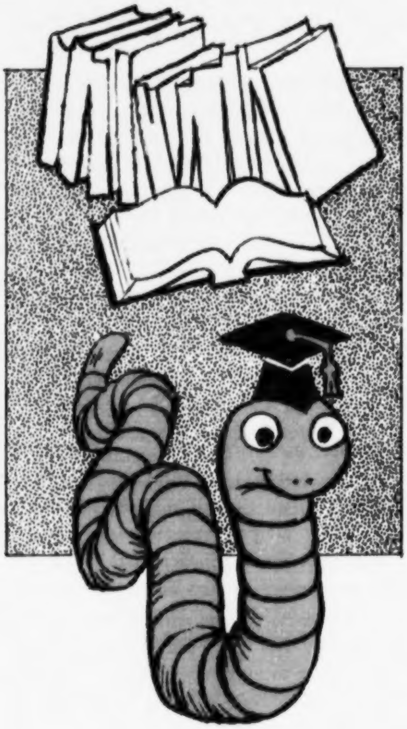
A privately published book, the *Worker Trait Group Guide* of the Appalachia Educational Laboratory, is almost identical in content to the *GOE*, although in a more popularized format with pictures and perhaps a little more detail.

Other specialized publications are *I Can Be Anything*, which specializes in brief descriptions of occupations that might offer opportunities for women; *Employment Opportunities for the Handicapped*, which makes a point of indicating after each occupational description the types of handicap that would not interfere with such an occupation; and *The National Apprenticeship Program*, which is mostly a list of apprenticeable occupations. (Details of training courses are available in special apprenticeship booklets for each occupation.)

The handbooks of the military describe very briefly the tasks, aptitudes needed, and related army assignments for a large number of occupations, but without information on outlook or salaries in the civilian world.

Most of the series of career briefs cover information similar to that in the *OOH*, often giving more details on daily activities and duties, but only for one occupation at a time. The Science Research Associates (*SRA*) pamphlets, Chronicle Guidance briefs, and vocational biographies are examples. Some briefs purposely omit certain information. *Job Fact Sheets*, for instance, do not attempt to keep up with outlook and salaries. The Guidance Centre briefs, which contain much information on daily tasks and personal require-

CAREER INFORMATION



ments, are published in Canada and therefore give Canadian salary and requirements for licensing and entry.

State briefs are variable. They are often very complete and contain State information on salaries and outlook that is not available in Federal publications or commercial briefs or books, but, of course, they differ from State to State. The publications of professional associations and businesses and industries also vary widely. They are often colorful and attractive, but are more likely to gloss over outlook and salary or special problems.

Periodicals, of course, will vary in their content from issue to issue. *Career World* and *Real World* are commercial publications aimed at the school market. They contain articles on different occupations in each issue. *Career World*, in particular, often gives very extensive

Publications Available at Secondary Schools

Publication and publisher	Percent of schools having publication	Ranking (availability among all publications, without regard to category)
Bound references		
Occupational Outlook Handbook (U.S. Department of Labor)	92.3	1
Dictionary of Occupational Titles (U.S. Department of Labor)	83.0	2
Occupational handbooks for the military (each branch publishes an edition)	74.9	3
The Encyclopedia of Careers and Vocational Guidance (J.G. Ferguson Publishing Co.)	45.6	10
I Can Be Anything: Careers and Colleges for Young Women (The College Board)	22.9	20
The National Apprenticeship Program (U.S. Department of Labor)	13.6	24
Guide for Occupational Exploration (U.S. Department of Labor)	10.8	26
Employment Opportunities for the Handicapped (World Trade Academy Press)	10.0	27
Worker Trait Group Guide (Appalachia Educational Laboratory)	8.3	29
Other	10.1	—
No response	2.3	—
Briefs and kits		
Pamphlets prepared by professional associations	53.3	6
Pamphlets prepared by private business	48.3	8
Chronicle Occupational Brief Service (Chronicle Guidance Publications, Inc.)	47.2	9
SRA Occupational Briefs (Science Research Associates)	40.5	12
Occupational briefs published by states	40.3	13
Career Briefs (Careers, Inc.)	30.8	16
Vocational biographies	20.4	22
Occupational Guidance Series (Finney Co.)	11.9	25
Job Fact Sheets (Council for Career Planning)	6.7	30
Guidance Centre Occupational Information Monographs (University of Toronto)	4.5	31
B'nai B'rith Occupational Brief Series (B'nai B'rith Career and Counseling Services)	4.0	32
Write-ups on jobs held by former students	3.3	34
Catalyst pamphlets (Catalyst)	2.3	35
Other	11.5	—
No response	8.6	—

information on job duties, working conditions, outlook, pay, training, related jobs, personal qualifications and other sources of information, written in a lively and interesting manner. *Real World* is also designed to be appealing to the high school student; it uses photographs, artwork, and newspaper style effectively. It may tend to include more high school level occupations than *Career World.* One excellent feature of both is that they usually give places to write for more information.

The Occupational Outlook Quarterly (OOQ) is another Government publication which serves as an outlet for Bureau of Labor Statistics information. Articles on individual occupations supplement the *OOH* during the 2 years between editions.

Occupations in Demand is a monthly Government newspaper based on computerized listings of job openings with the United States Employment Service. It gives only the number of openings, cities where they are located, and the range of salaries offered. Civil Service examination announcements (Federal and State), which list Government job openings, also give short descriptions of the work, education and experience requirements, and starting salaries.

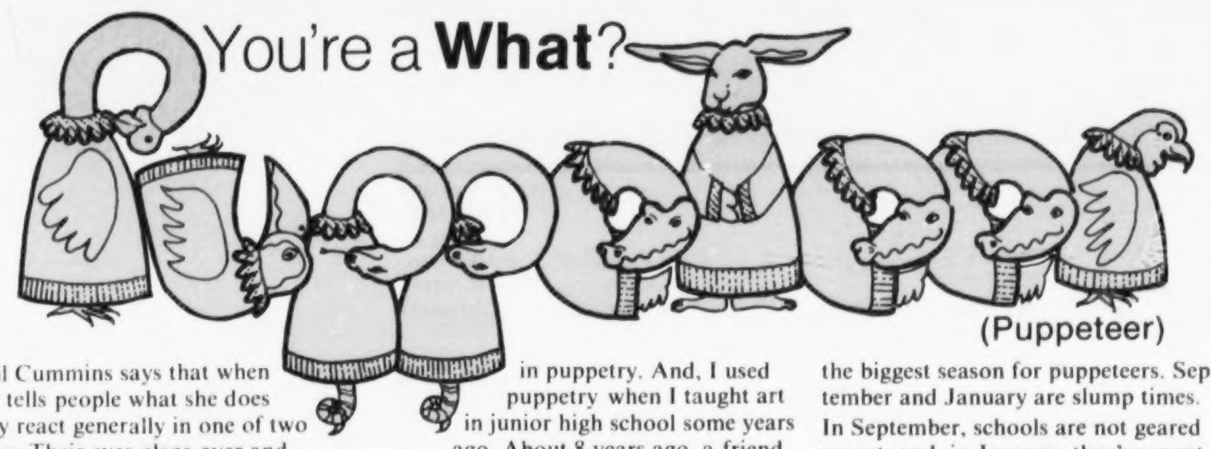
Because of their length, the books on individual occupations can include far more details on job duties, working conditions, strategies for entry, advancement, and transfer than the briefs and compendiums. The series are all similar in their content and approach, but each individual book is written by a different author.

Directories of businesses and industries give names and locations of specific employers. Directories of colleges and vocational schools give the names and addresses of schools or colleges offering specific programs for specific occupations. They do not give any other information.

Publication and publisher	Percent of schools having publication	Ranking (availability among all publications, without regard to category)
Periodicals		
Occupational Outlook Quarterly (U.S. Department of Labor)	52.9	7
Career World (Curriculum Innovations Inc.)	43.6	11
Civil Serivce examination bulletins (U.S. Office of Personnel Management)	32.3	15
Real World (Henry Korman)	24.2	19
Occupations in Demand (U.S. Department of Labor)	9.8	28
Other	7.6	—
No response	20.8	—
Book series on individual occupations		
Your Future in. . . . (Arco or Richards Rosen Press, Inc.	25.8	18
Your Career in. . . . (Julian Messner)	20.9	21
Opportunities in. . . . (Vocational Guidance Manuals)	14.6	23
Other	5.7	—
No response	61.3	—
List of employers		
School prepared card files or lists of employers, speakers, and contacts	36.7	14
Directories of businesses and industry	28.6	17
Other	4.7	—
No response	48.5	—
Directories		
Vocational school directories—such as Lovejoy's Career and Vocational School Guide (Simon and Schuster Inc.) and Directory of Post-Secondary Schools with Occupational Programs (U.S. Department of Education)	74.2	4
College directories arranged by occupation—such as College Blue Book (Macmillan Co.)	70.1	5
Job training directory for school staff	3.5	33
Other	10.9	—
No response	14.1	—

Source: Warren Chapman and Martin Katz, *Survey of Career Information Systems in Secondary Schools, Final Report of Study I,* August 1981, (New Jersey, Educational Testing Service, 1981).

You're a **What?**



(Puppeteer)

Gail Cummins says that when she tells people what she does they react generally in one of two ways: Their eyes glaze over and they have nothing to say or they say, 'That's great!' remembering when they went to puppet shows as children. For Gail and the 2,500 other members of the Puppeteers of America, creating similar memorable experiences for people is part of what they do everyday.

Since 1973, Gail has headed a puppet troupe called the "Vagabond Puppet People." Being a puppeteer goes far beyond just moving puppets around. Rather, a puppeteer must use a whole array of theatrical and artistic talents. To find out more about the work of a modern day puppeteer, *OOQ* staffwriter Gail M. Martin spent some time with the Vagabond Puppet People and talked with Gail Cummins in her studio in Arlington, Virginia.

OOQ: **What is a puppeteer?**
Cummins: A puppeteer is one who entertains with puppets, such as marionettes, hand puppets, mouth puppets, rod puppets, or shadow box puppets. As German marionette master Albrecht Roser has said: "The moment you believe you have created life and want to share your fantasy creation with another, you are a puppeteer." There's certainly more to puppeteering than just manipulating puppets. A good puppeteer is a jack-of-all-trades, so to speak. Puppeteers must be adept at writing scripts, constructing puppets, choreographing shows, and much else.

OOQ: **How did you get started in puppetry?**
Cummins: Well, I've been involved in theatrical arts for as long as I can remember. I was a fine arts major in college and completed a master's program in theater arts with an emphasis in puppetry. And, I used puppetry when I taught art in junior high school some years ago. About 8 years ago, a friend asked me to join her puppet troupe. After a year, I started my own troupe with a fellow puppeteer.

OOQ: **Where do puppeteers work?**
Cummins: Most puppeteers work for themselves. Puppeteers also work for established troupes or for entertainment organizations that have contracts with amusement parks. Some puppeteers use puppetry in therapy—either speech therapy or occupational therapy; they are usually employed by hospitals. Puppeteers also work on cruise lines doing shows for adults in cabarets. You know, in other countries, puppetry is more for adults than for children.

OOQ: **What does running a puppet troupe entail?**
Cummins: Well, there's handling the business of the troupe and the schedule. We are a non-profit organization, so we work with a board of directors who oversee the business operations. We also have an executive director who handles such things as bookings and public relations. Occasionally, she fills in as an extra puppeteer, but she really has a lot to handle just taking care of the business details of the troupe. Henry is the other full-time puppeteer besides myself. We also contract the services of an additional puppeteer for some shows.

OOQ: **Are all puppet troupes non-profit organizations?**
Cummins: No. We do a lot of educational work, that's why we're non-profit. We give classes in puppetry for the public and in the schools.

OOQ: **Is puppetry a seasonal business?**
Cummins: Yes. Christmas is probably the biggest season for puppeteers. September and January are slump times. In September, schools are not geared up yet; and, in January, they've spent all of the money in their budget in the previous month! Summer is also a busy season, especially for puppeteers who work in amusement parks. Not for us, though. Schools are our primary clients, so we gear down in summer; but, we're attempting to change that. Traditionally, our troupe members have found summer jobs in the interim, as do the members of other troupes. It's helpful to have something to fall back on. Henry substituted as a teacher, but not everyone is qualified to do that. Lots of puppeteers take part-time jobs that give them flexibility.

OOQ: **What are salaries like in the field?**
Cummins: Salaries aren't tremendously high for puppetry in children's theater. An executive director or business manager generally makes about $14,000 to $18,000 per year. A full-time puppeteer makes anywhere from $150 to $200 per week.

OOQ: **What are the steps in making up a troupe show?**
Cummins: After we've brainstormed and come up with some ideas I write a draft of a script. Then I pass it around for the troupe to read and give me their reactions. After we have it in reasonable form, we have it copyrighted. We do however, make more changes in it even after that, if need be, since ideas always come to us in rehearsal. For some shows, we do the narrative live, and some are taped; but, the music is always taped.

OOQ: **What about choreography? You haven't mentioned that yet.**
Cummins: Well, in traditional troupe shows the puppets usually move in a

]

rather simple fashion so we only do blocking, that is, planning out our hand movements. In other, more elaborate shows, we do use choreography—that is, actually planning out dance movement for the puppeteers.

OOQ: **Do you also make the puppets for each show?**
Cummins: Yes, we design and make all of our puppets, unless we're rejuvenating an old show. Like every other troupe, we have a backlog of shows we're always rethinking and will put back on the road.

OOQ: **What about the set? How long does it take to build?**
Cummins: It varies, depending on the design. First, I draw my plan. I try to get an idea of dimensions and the colors I want to use. Then, I see what's in our storehouse that I can use. Next, I go on a shopping trip. Sometimes our plans change half-way through construction.

OOQ: **Isn't it frustrating to have to change the plans for your set when you're so far along?**
Cummins: No, it's absolutely essential in puppetry that you be very flexible. You have to be willing to let go of an idea if it won't work for a particular show. You must be willing to start over. This goes for the set, script, and music.

OOQ: **Is it a great advantage to have studied puppetry in college?**
Cummins: Yes, I think so. The big advantage is you get extensive exposure to all of the forms of puppetry—marionettes, mouth puppets, rod puppets, shadow box, and black theater. Courses in puppetry, of course, are always helpful—courses such as the history of puppetry, construction of hand puppets, construction of marionettes, and script writing. General theater arts courses are also helpful—courses such as acting, voice and movement, lighting, sound, set design, costume design, and set construction.

Photo by George Borsfay

OOQ: **Where do you get ideas for your scripts?**
Cummins: I read constantly. I use a lot of folk tales and adapt them, as is traditional in puppetry. I believe in stretching the child's imagination.

OOQ: **What are some skills necessary for puppeteering?**
Cummins: Some acting ability is necessary, as well as the ability to use your voice in a number of ways; they're both essential if you're working a live show. It's helpful to be competent in the technical details to be able to deal with lighting and audio equipment. You should also have experience building sets, sewing, and using power tools.

OOQ: **So far, everything sounds great. Surely there must be disadvantages to working in the field?**
Cummins: The performing arts are always a hair's breadth away from financial disaster, so that may be a disadvantage. Some people may not be able to tolerate the instability.

OOQ: **What would you recommend to anyone interested in getting started in puppetry?**
Cummins: First, get a solid background in theater, through a college program or working with a community theater. Do as much puppetry as possible, either with a troupe or on you own, by doing birthday parties or charity shows. If you have puppeteers in your area, try to work with them. The biggest thing is that you must love it, because even though it's rewarding, it's certainly not easy.

For information on membership in our professional association, which publishes *Puppetry Journal*, write to

Puppeteers of America, Inc.
6216 North Morgan St.
Alexandria, Virginia 22312. OOQ

Counseling Aids

Publications (of the Accreditation Board for Engineering and Technology), 2 pages, is a list of pamphlets, reprints, and books for people interested in jobs in engineering and technology. Among the publications listed are "Accredited Programs Leading to Degrees in Engineering," "The Young Engineer: A Professional Guide," "New Careers in Engineering Technology," "Make Your Career Choice Engineering," and "Woman Engineer." Available free from the Accreditation Board for Engineering and Technology, Publications Office, 345 East 47th Street, New York, N.Y. 10017. Include a stamped, self-addressed business envelope or a return addressed label and stamps.

Women's Handbook, How SBA Can Help You Go Into Business, is a 16-page booklet that gives a sampling of the Small Business Administration's resources that can help women entering the ranks of small business ownership. It explains what the Small Business Administration does, including three counseling programs. It also discusses various types of financial assistance available and provides advice on how to apply for a loan. Available free from SBA, P.O. Box 15434, Fort Worth, Texas 76119.

The Supply of Accounting Graduates and the Demand for Public Accounting Recruits, 1981, 32 pages, discusses the supply of accounting graduates, the demand for public accounting recruits, and the relationship between supply and public accounting demand. The report indicates that the number of accounting graduates with bachelor's and master's degrees is expected to increase, but the rate of growth of bachelor's and master's degrees awarded in accounting is expected to decline. The public accounting demand for bachelor's and master's degree graduates is expected to increase over the next 4 years. Available free from the American Institute of Certified Public Accountants; 1211 Avenue of the Americas; New York, N.Y. 10036.

Wanted: More Women in Science and Technology, a packet of information and suggestions for junior and high school counselors and teachers, contains three booklets. The first, "What Can Counselors and Teachers Do To Encourage Young Women," (44 pages) contains suggestions based upon others' experiences that can aid in developing a more supportive environment for women students. The second, 32 pages, has two parts, "An Overview of Science and Engineering Careers" and "Sources of Information About Careers and the Education and Employment of Women." The third, "Especially for Women Students: Facts, Fiction, and Fun Reading About Science and Technology," (16 pages) is a bibliography. The packet is available from the Committee on the Status of Women in Physics, American Physical Society, 335 East 45th St., New York, N.Y. 10017. Price: $3.

A Career in Music Therapy indicates that music therapy is the use of music to retore, maintain and improve mental and physical health. Music therapists, the 4-page publication says, work with socially and emotionally maladjusted adolescents and adults, with the mentally retarded, and with geriatric patients. The publication includes a list of colleges that offer programs approved by the National Association for Music Therapy. Available free from the National Association for Music Therapy, Inc.; 901 Kentucky St., Suite 206; P.O. Box 610, Lawrence, Kansas 66044.

Careers in Public Relations points out that public relations takes many forms in different organizations and goes under many different names such as public information, investor relations, public affairs, corporate communications, and consumer relations. But basic to all public relations is communicating. This 12-page pamphlet indicates the personal qualifications and preparation, including work experience, that jobs in public relations require and describes how to go about finding the first job. It also discusses salaries and kind of work done. Available free from the Public Relations Society of America, Inc., 845 Third Avenue, New York, New York 10022.

Social Work: Careers in Health, describes the role of social workers within the health care field. A 6-panel flyer, it lists the kinds of institutions that employ social workers, notes the different kinds of services performed by social workers, and indicates sources of additional information. Available free from the National Association of Social Workers, Inc., 1425 H Street, NW., Suite 600; Washington, D.C. 20005.

Where Shall I Go to College To Study Advertising? provides 30 pages of information about schools that offer a major, sequence, specialization, area, option, emphasis, or concentration in advertising. Besides defining what these terms mean, the pamphlet contains entries for 90 or so schools, detailing the degree awarded, the number of students, the financial assistance available, entrance requirements, and tuition. Available from Advertising Education Publications, 3429 55th St., Lubbock, Texas 79413. Price: $1.

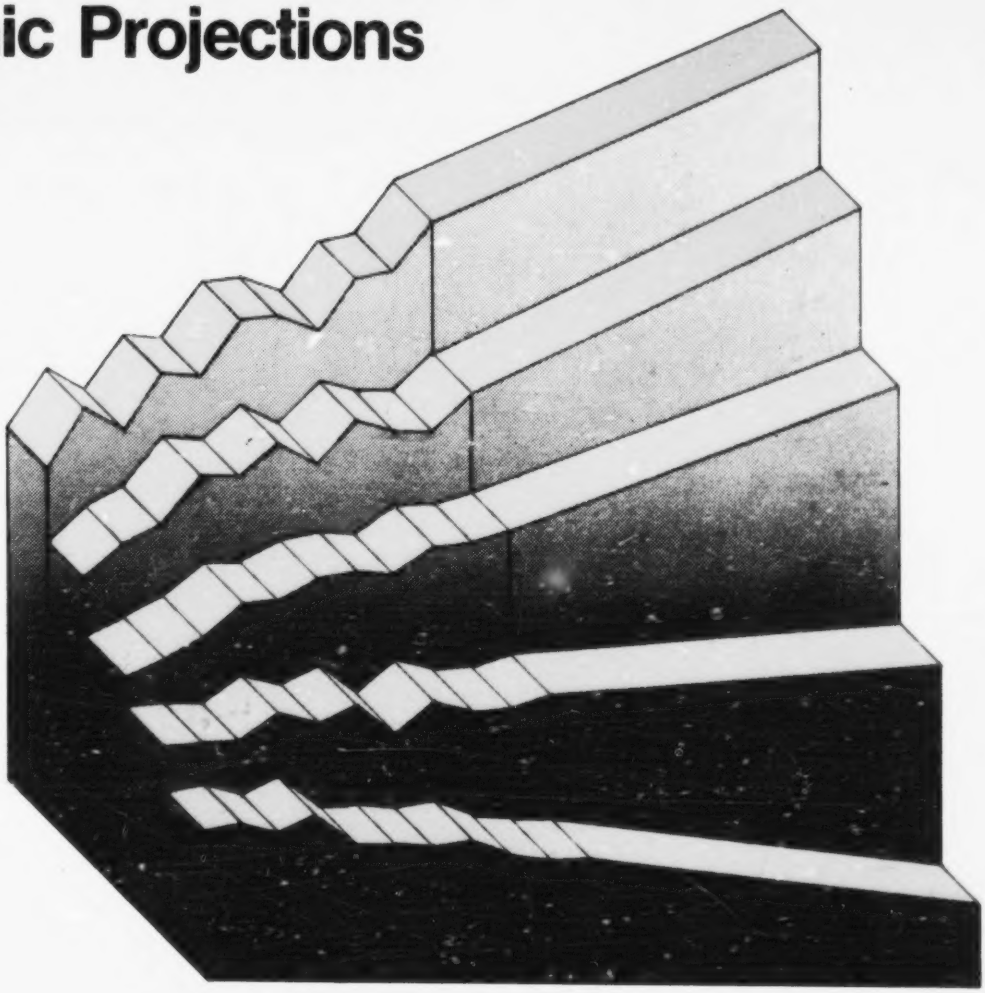
Economic Projections to 1990

Here are the latest Bureau of Labor Statistics projections of the United States economy to 1990.

These projections are part of the ongoing program of the Bureau of Labor Statistics for study of alternative patterns of economic growth.

Topics covered include:

- New Economic Projections Through 1990—An Overview
- The U.S. Economy Through 1990— An Update
- The Outlook for Industry Output and Employment Through 1990
- Occupational Employment Growth Through 1990
- The 1995 Labor Force: A First Look



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Fall 1982

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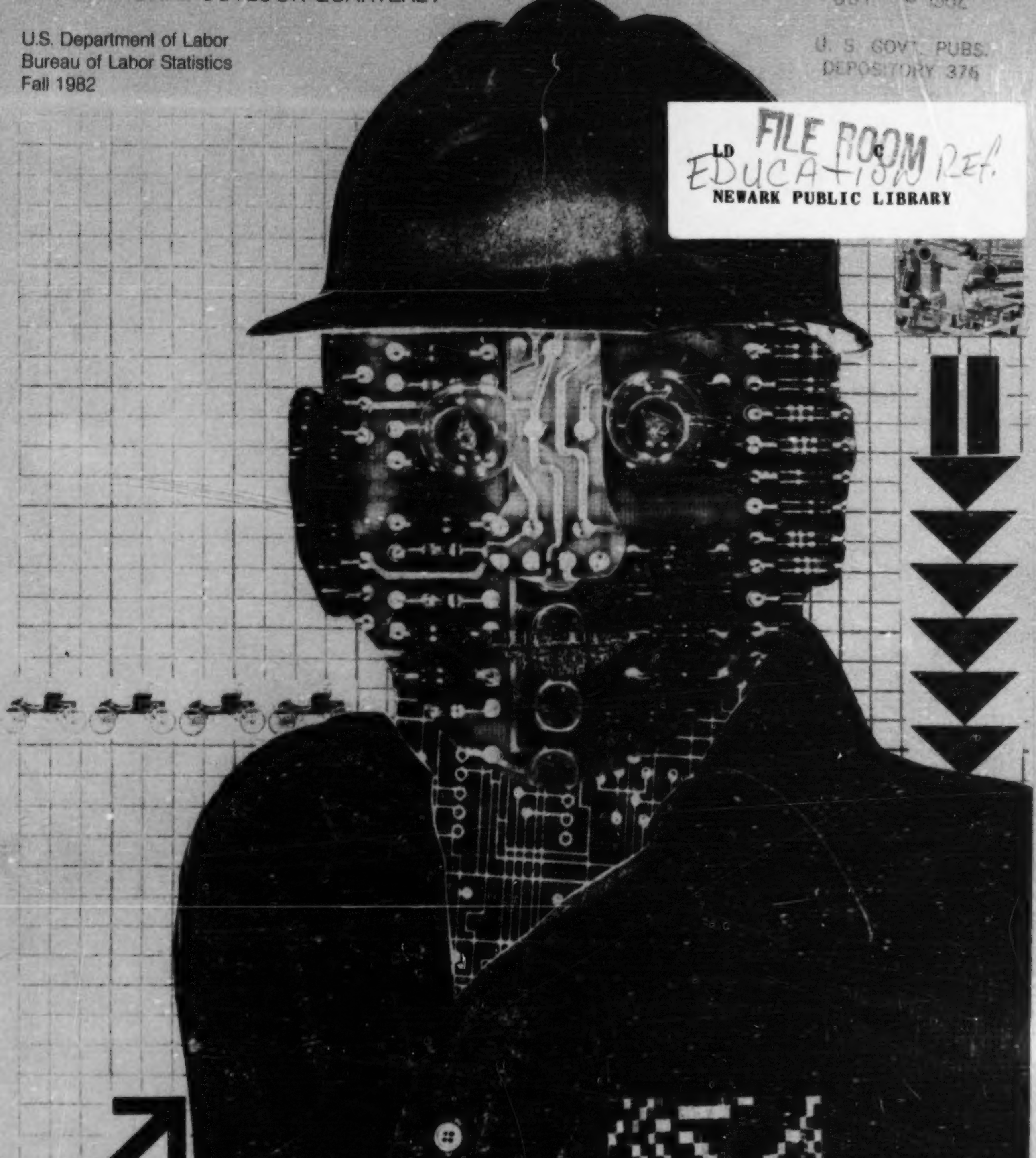

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Bureau of Labor Statistics
Janet L. Norwood, Commissioner

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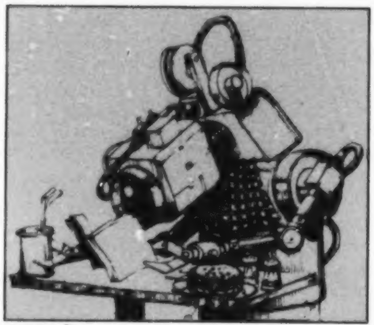

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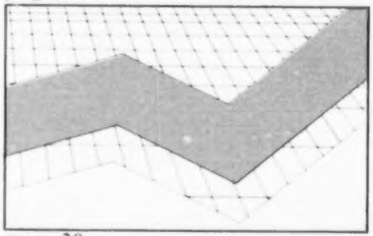

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INDUSTRIAL ROBOTS
Join the Work Force

by Gail M. Martin

Robots are not new. They have been around for 15 or 20 years, but it was not until about 5 years ago that robots became cost effective and functional for use in industry. The development in the sixties of the microprocessor, a computer so small that it fits onto a silicon chip smaller than a paper clip, helped along the robot's development. Compact in size and relatively economical, the chip was well-suited to be the "brains" of the robot. And so began an increase in the robot "population" and the increased use of robots in the workplace.

This trend has stirred concern among many who fear that the robot could replace much of the work force in some occupations. Others see the introduction of robots into industry as a means of increasing productivity and of saving industries and jobs that might be lost to foreign competition. Still others see the growing use of robots as an evolution of current automation trends rather than a revolutionary change. They predict no major disruptions in employment because of the new technology. Yet, concern lingers over what trends will develop in the years ahead. Although no one can predict the future with certainty, it is helpful to know what robots are doing now, what they may be capable of doing in the future, and what effects their use may have on the work force and society in general.

Industrial Robots Today

The Robot Institute of America defines a robot as "a *reprogrammable*, multifunctional manipulator designed to move materials, parts, or specialized devices through variable programmed motions for the performance of a variety of tasks." *Reprogrammable* is a key word in the definition, since the mechanical arm must be computer-controlled to qualify as a robot. As such, the robot's actions can be changed or modified by providing a new set of instructions, or reprogramming it, without modifying the hardware. So, generally, robots may be programmed to perform different tasks.

This versatility is very useful because a robot can be adapted to new tasks when styles or product lines change. Factories have long used automatic machines in mass production, but these machines could only perform one task at a time. For new tasks, new machinery or extensive retooling was necessary. Robots represent a breakthrough in technology because they have programmable memories.

Estimates of the number of robots in use in the United States and worldwide vary, but most people agree that the robot population will grow in the years ahead. As robotic technology is refined, robots will become more economical to make and hence cheaper to purchase. Also, as more companies begin manufacturing robots—and some large computer and capital goods manufacturers have begun doing so already—the price of robots should drop even further. Last year the number of companies making robots increased 30 percent as more and more companies entered the field. Some industry analysts predict that by 1990, as many as 120,000 robots may be at work, and perhaps half of these in the United States alone.

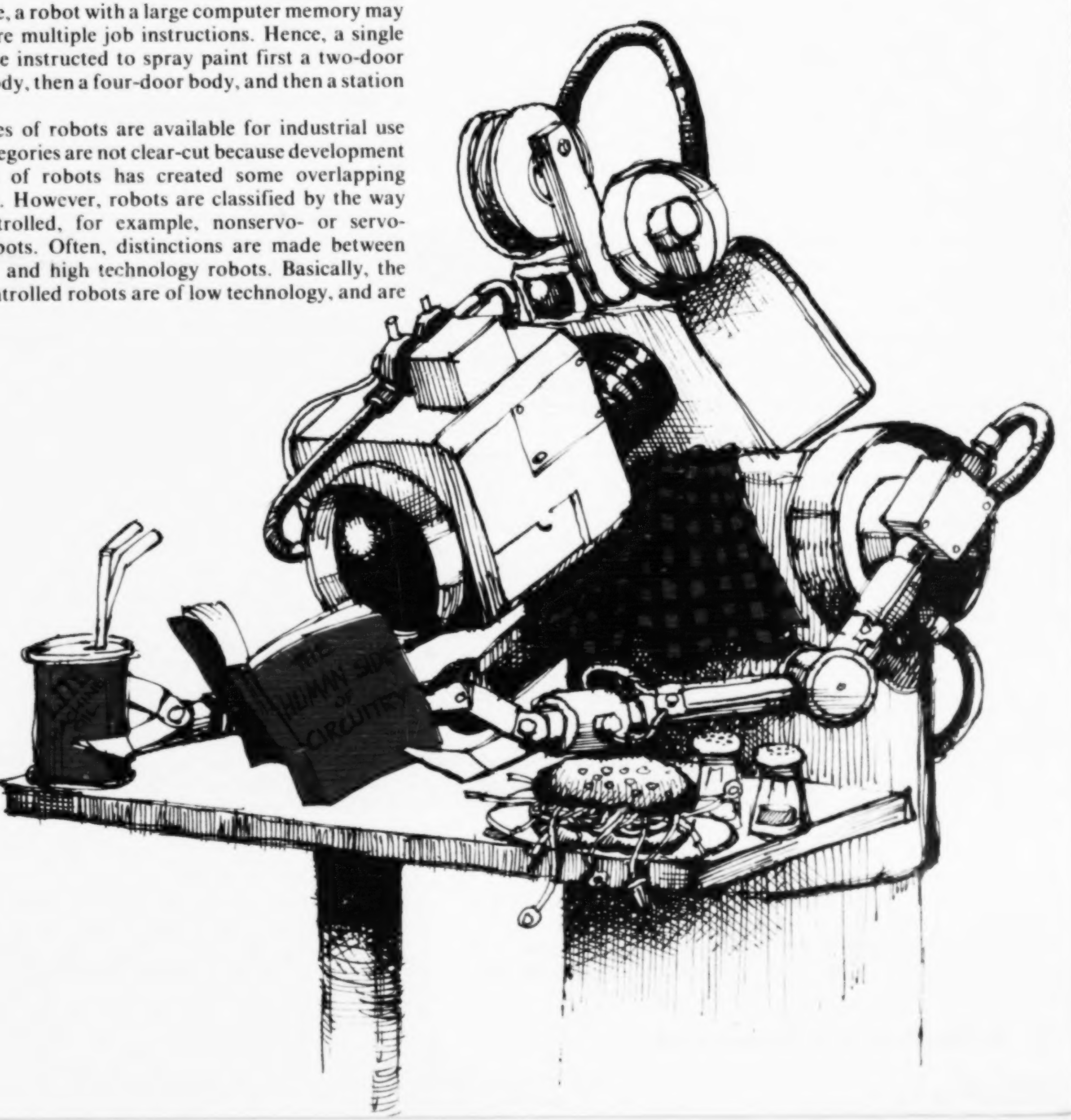
A survey done by the Robot Institute of America, "1981 Worldwide Survey on the Industrial Robot Population," provides perhaps the most up-to-date statistics of the worldwide robot population. Excluding mechanical transfer devices (*nonreprogrammable*, pick-and-place devices), the survey revealed that 14,246 industrial robots were in use in Japan, 4,100 in the United States, and 1,420 in Germany. These numbers change considerably, however, when the nonreprogrammable devices excluded above are included in the count. These fixed sequence devices cannot be reprogrammed and must be taken apart or almost rebuilt to change the tasks they can perform. Considering these other simpler devices too, the Japanese have more than 55,000 machines in use.

Robots come in all shapes and sizes. One thing industrial robots of all types have in common, however, is that they do not resemble human beings, although some science fiction films have portrayed them that way. Rather, most industrial robots resemble huge arms. These arms, called manipulators, can move parts or tools through programmed sequences of motions and operations that need not be repetitive. The computer enables the robot to be applied to many different operations. This gives it flexibility that old-fashioned automation equipment, designed for a specific application, does not have.

Gail M. Martin is an OOQ staff writer.

For example, a robot with a large computer memory may be able to store multiple job instructions. Hence, a single robot might be instructed to spray paint first a two-door automobile body, then a four-door body, and then a station wagon.

Several types of robots are available for industrial use today. The categories are not clear-cut because development in the design of robots has created some overlapping between types. However, robots are classified by the way they are controlled, for example, nonservo- or servo-controlled robots. Often, distinctions are made between low, medium, and high technology robots. Basically, the non-servo-controlled robots are of low technology, and are



fairly simple. The more expensive, servo-controlled robots are of medium and high technology. They are more complex and have greater capabilities.

Generally, nonservo robots perform a single program. They are programmed by setting up a sequence of moves or mechanical stops. They have relatively high speed compared to the servo-controlled robots, usually because their manipulators are smaller. They are simple to operate and easy to program and maintain. By far the greatest number of industrial robots in use are of this type. Robots that handle material are usually nonservo, pick-and-place robots. For example, a robot that feeds parts to a punch press would be a nonservo-controlled robot.

The servo-controlled robots, on the other hand, are more complicated. They are programmed by guiding the manipulator through the desired sequence. These moves are recorded in the memory of the robot. Increased flexibility and an ability to store more than one program in its memory are important features of the servo-controlled robot. In sheet metal fabrication, for example, a servo-controlled robot picks up a part from a table, aligns it for riveting, and then feeds it into an automatic riveter.

All servo-controlled robots have internal sensors that provide them with information about the position and motion of the piece being worked on. The high technology robot has, in addition to these internal sensors, external sensors that provide it with information about its environment. Efforts to develop external sensory systems more fully and equip robots with artificial intelligence (decision-making capabilities) will lead to industrial robots that are capable of far more complex tasks than are now possible.

Vision capability is expected to greatly increase the role of robotics in manufacturing. Visual ability is important because it permits the robot to distinguish exactly where things are and how they are oriented. Tactile sensing plays the same role for a robot as for a human: It provides confirmation that a tool is being gripped correctly or that a bolt fits into a hole as it should.

Robots are not cheap. Prices range from around $10,000 for a simple, nonservo-controlled, low technology robot to $120,000 for a high technology one that is servo-controlled. But often the cost of the robot itself accounts for only 30 to 50 percent of the total cost of the application. The remaining expenses are for the engineering and extra tooling needed to incorporate the robot into the production line.

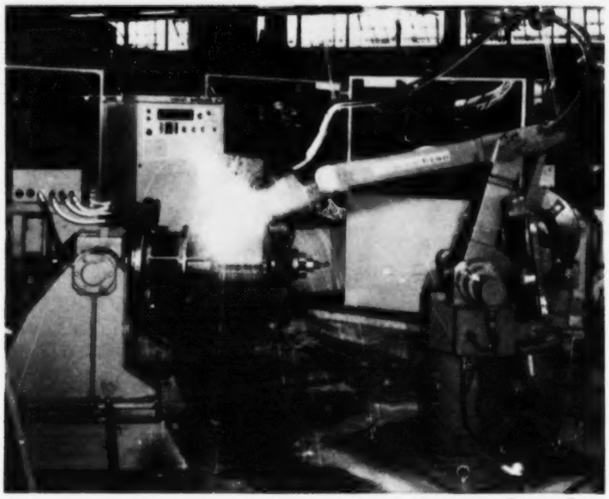


photo courtesy *Robotics Today*

The cost of robots, however, is declining and will continue to decline even further, especially when some of the large computer and equipment manufacturers enter the field. As the market expands, the prices of robots are expected to drop since manufacturing costs decrease when production volume rises.

While future demand for robots and the potential robot population are subjects of conjecture, the present demand for industrial robots is very real. Robots are valuable to industry for some of the qualities usually attributed to machines: Untiring availability, repeatability, dependability, accuracy, and relative imperviousness to hostile environments.

The advantage of these attributes has been perceived by industrial users. Richard Beecher, department head of General Motors' Perception and Robotics Unit notes, "Based on our 14 years of experience with the industrial robot, we know that it does, in fact, reduce operating costs, increase productivity, improve product quality, reduce scrap, reduce OSHA compliance costs, and improve our capital equipment."

Robots are well suited to repetitious tasks. As Bernard Sallot of the Robot Institute of America points out, "People get bored doing the same job over and over. A robot doesn't."

Indeed, robots can take over jobs that are not only boring, but unsafe and unhealthy. According to the Society of Manufacturing Engineers, some of the most logical applications of industrial robots are ones in which the safety and environmental conditions of a work station are so severe that it is difficult or dangerous for a human to work there. These typical applications include forging operations, acid or chemical spraying or dipping, quenching, sand blasting, paint spraying, and noisy operations.

Robots in Action—Today

Because of their versatile nature and usefulness, robots have found many applications in industry. Walter K. Weisel, vice president of Prab Conveys, Inc., a robot manufacturer, says, "Robots are the only tool the United States has available that affects virtually every manufacturing process, such as diecasting, plastics, glass handling, press loading, machine tool loading, forging, spot welding, arc welding, material transfer, assembly, investment casting, shot blasting, painting, and many others."

Welding and paint spraying probably represent the majority of applications of robots in industry. Robots do spot welding, pedestal welding, arc welding, and stud welding. Many of these applications are used in the auto industry. Richard Beecher describes the use General Motors has made of robots: "With today's industrial robots we can load and unload machines, transfer parts, paint cars and components, spot weld, arc weld, assemble complex sub-assemblies, inspect auto bodies and sheet metal, palletize and depalletize parts, and deburr castings."

In auto plants, robots are also used for checking gauges and tolerances, investment casting, stamping, diecasting, forging, heat treatment, machine tool loading and unloading, conveyor transfer, plastic molding, adhesive lay-up, foam lay-up, glass-handling, and dimensional inspection.

Industry Users. According to a study done by Carnegie Mellon University, "The Impact of Robotics on the Work Force and Workplace," almost all industrial robots are used within the durable goods manufacturing industries, commonly referred to as the "metalworking sectors." These include primary metals, fabricated metals, machinery except electrical, electrical and electronic equipment, and transportation equipment and scientific instruments.

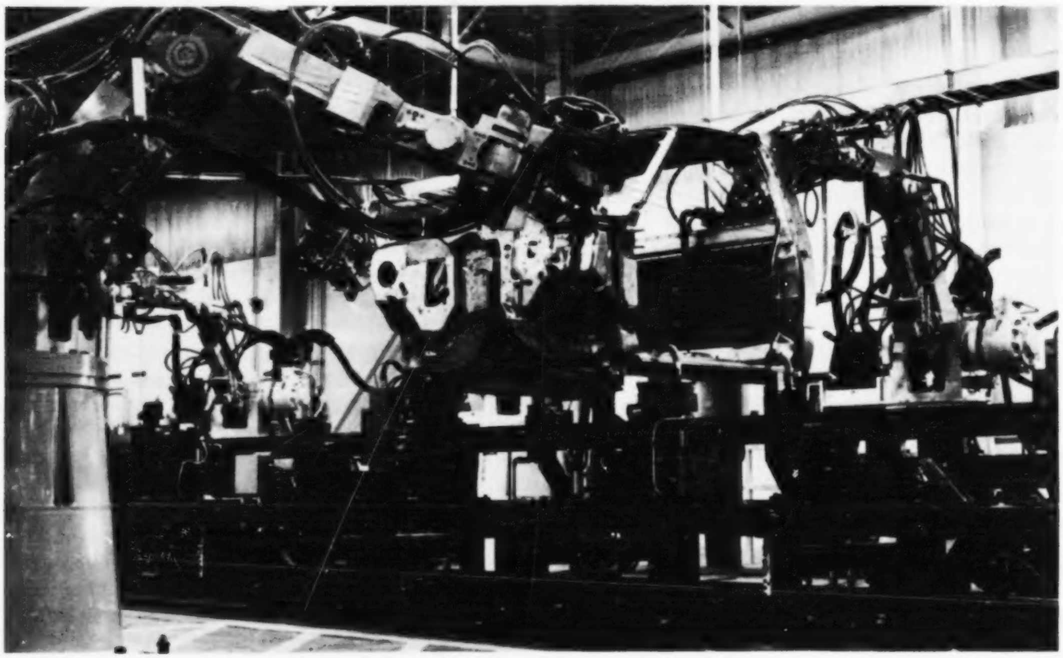
All major automobile manufacturers are now using robots on their production lines. As of 1980, roughly one-third to one-half of all robots manufactured in the United States were shipped to auto plants. According to Frost and Sullivan, Inc., the automotive industry spent $15 million on robots in 1979 and plans to spend $54 million in 1985. General Motors alone has projected an installed cumulative base of robots in its facilities of at least 14,000 by 1990, up from 302 in 1980.

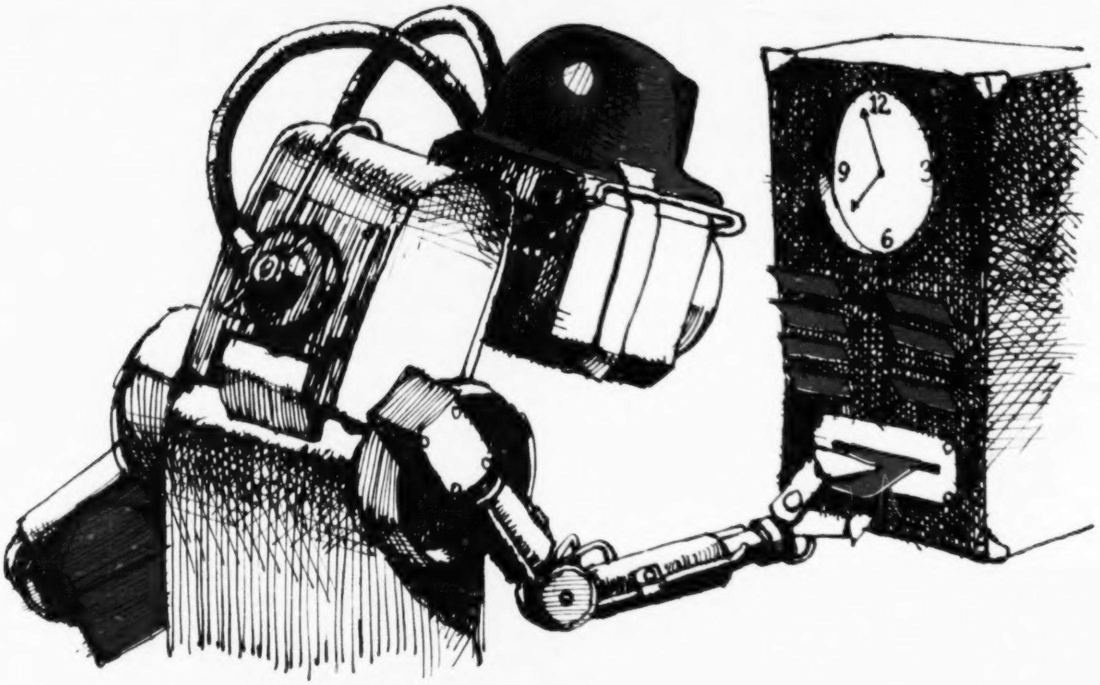
According to Peter Blake of Robotics International, the appliance industry is a large user of robots now and will be a larger user of robots in the future.

Aerospace manufacturers have used robots for some time, aided by the research efforts of the U.S. Air Force. The Air Force has supported research and design of integrated computer-aided manufacturing systems. The program assists manufacturers of defense aircraft in designing and implementing these systems. Robots are used to drill wings of aircraft and to rivet parts together, among other things.

Manufacturers of farm equipment have used robots for spray painting, machine loading and unloading, material handling, and for a large number of foundry jobs.

photo courtesy *Robotics Today*





Robots have been used in the primary and fabricated metal industries to move heavy castings, stir baths of molten metal, and dip parts into tanks of ceramic slurry. Foundries, likewise, have used robots for forging and hazardous operations.

The electrical components industry as well as some electronics firms have also used robots. Texas Instruments, according to Philippe Villers, president of Automatix, Inc., a robot manufacturer, has set up a system of robots to test small calculators. A nimble robot picks up the calculator from test machines, while another presses keys in a predetermined way; a third reads to see if the calculator has come up with the right answers.

Robots in Action—Tomorrow

The number of jobs that robots can do is growing every day. According to industry analysts, the growth rate in applications can run between 35 and 42 percent annually.

Assembly tasks, for example, are expected to be taken over more and more in the future by robots as machines are developed especially for assembly, such as the PUMA (programmable universal manipulator for assembly). Although robots are used to a limited extent in assembly jobs right now, most are not capable of small-parts assembly. Simple pick-and-place devices, or nonservo-controlled robots, are inadequate for most assembly jobs. Advanced manipulators designed especially for assembly are only beginning to be applied in industry. According to industry professionals, only a small fraction of industrial robots in use today are at work assembling products. Yet engineers and others say this is the next big area of use for programmable manipulators—assembling durable goods.

Robotic applications will extend to nonmanufacturing industries for many of the same reasons they have made inroads in manufacturing.

In the nuclear industry, robots may be used for various handling tasks at nuclear power plants and to process radioactive waste. They could be very useful for tasks associated with decommissioning nuclear reactors that have reached the end of their operating lives or refurbishing operating plants. Also, robots could be extremely helpful in the event of a major failure in a nuclear reactor.

In health care, robots are being developed to assist physically handicapped and aged people. The Veterans Administration is currently using some robot technology to provide a mechanical servant for quadriplegics. Another device is being tested that responds to commands given by voice and head movement.

In agriculture, it is envisioned that robots will be used for spraying and crop dusting. The Japanese even expect robots to be used for tilling the ground and milking and feeding cows.

Robots are well-suited for a variety of underseas activities. In Japan, one company is already using an underwater robot in bridge building. Underwater geological surveying has also been accomplished by robots in Japan. The U.S. Navy is working on developing robots that can inspect two-dimensional objects and perform underwater tasks, and is working on applications in shipbuilding and aircraft construction.

In construction, it is expected that robots will eventually be used in fabricating high-rise buildings and in paint spraying bridges.

Effects on the Work Force

As robots move into the workplace, the obvious question arises—what happens to the work force? The potential effects of robots and new technology on the work force have only begun to be explored. For many reasons, these effects are difficult to study or predict. Yet this is an area of intense concern to many people.

The few estimates that have been made on the potential displacement of workers vary widely. Many economic factors influence how fast business and industry adopt robots and other new technology.

How fast industry adopts robots is tied into the cost of robots. Some think the price of robots is attractive to industry. Says one analyst, "The robot is more than a machine, it is an irresistible economic force." But for some small-and medium-sized companies, purchasing a robot represents a major investment. Almost all companies considering robots compare the cost of the machine against the labor cost that could be saved. Wage rates, then, affect how valuable robots will be as substitute labor.

As mentioned before, the cost of a robot encompasses not only that of the robot itself, but also the expense of fitting it into the existing factory or production line. Sometimes robots may only pay if applied in a whole new facility.

Reasonably priced robots could prove to be attractive to industry and favorably influence their adoption. Likewise, the pressure of foreign competition could push American manufacturers to adopt robotic technology to remain competitive. Finally, the further development and refinement of computer-aided design (CAD) and computer-aided manufacturing (CAM) could be yet another boost to the use of robotic technology in industry.

Even after robotic technology is adopted, it is still difficult to predict its effects on employment. An important issue is whether companies will effectively use robots after they buy them. For example, the Carnegie Mellon University study said one engineer from a company complained that production engineers are so used to thinking in terms of traditional, fixed automation, it is difficult to get them to think in terms of using programmable robots. This is a significant point, since the chief advantage of robots is that they are a flexible technology and generally require only reprogramming, rather than retooling, to be adapted to changes in production. The Carnegie Mellon University study furthermore found that despite the frequent mention of this flexibility in the trade literature, it was not nearly as important a motivation of their survey respondents as was saving labor costs.

Consequently, generalizations about productivity cannot safely be made solely on the basis of the number of robots in place and the number of companies using robotic and other advanced technology. Given that robots will be used, if robots are not used to their full advantage, they may displace workers without creating productivity gains. On the other hand, they may also have less of an impact on workers.

With these variables in mind, it is easy to see why there is little agreement as to what effects robots and new technology will have on the work force. Let us look at some of the projections that have been made.

As for numbers of workers affected by robots and new technology, estimates range from relatively low to high. The Carnegie Mellon University study offers the most detailed analysis of the number of jobs that potentially could be roboticized. Researchers there conclude that nearly one-half million workers in operative positions in manufacturing in the automotive, electrical equipment, machinery, and fabricated metals industries (the metalworking sectors) could be replaced by nonsensor-based robots. The figure doubles to 1 million people in these same industries if sensor-based robots are considered, says the Carnegie Mellon study. Extrapolating the data for metalworking to other manufacturing sectors, Carnegie Mellon University researchers conclude that nonservo-controlled robots could replace up to 1 million workers while servo-controlled robots could replace up to 3 million out of a total of roughly 8 million operative workers in manufacturing. According to researchers, the time frame for this displacement is at least 20 years.

The Carnegie Mellon University estimates could be viewed as an upper bound. The study notes that the estimates of the number of jobs that robots could do is not a reliable estimate of how many workers will lose their jobs. But it points out that the figures indicate the magnitude of people who are likely to be affected in a direct way, without distinguishing how many will lose jobs, how many will be transferred, or how many will be retrained.

Harley Shaiken, research fellow at the Massachusetts Institute of Technology and past consultant to the United Auto Workers, offers an estimate at the high end also. He suggests that by 1990, at least 100,000 auto workers alone could be replaced by 32,000 robots. He also suggests that the potential loss of jobs is more serious than these figures indicate, since more advanced robots could displace far more workers in a decade. Moreover, according to Shaiken, "The employment effects are cumulative and have a disproportionate impact on a few key industries."

On the other hand, the Robot Insitute of America predicts that only a small segment of the work force will actually lose their jobs as a direct result of robots. According to Peter Blake, the latest study completed for the Institute by the University of Michigan indicates that by 1990, 440,000 jobs that are now done by humans will be filled by industrial robots. The study suggests that substantial numbers of displaced workers will be retrained by their companies and only 22,000 people may actually lose their jobs. The survey concludes that there may even be a net gain in jobs because of robots, since there will be a need for operators and maintenance teams, as well as workers to produce the machines themselves.

Other Changes in the Work Force

Although the number of workers that could be affected by robots is of interest and concern to many persons, it certainly is not the only issue that robots and new technology will create in the work force and in society in general. Equally serious concerns are the following: Changes in the nature of the workplace, changes in the composition of the work force, changes in skill requirements of jobs, and the problems of worker retraining and the concomitant shifts necessary in vocational education programs.

An obvious advantage of robots joining the work force is that robots, like other innovative technologies, contribute to the quality of worklife by taking over some dull and hazardous jobs. Richard Beecher, from GM, points out these advantages: "Robots can be applied to those tasks which are least pleasant for our employees and which may require the most extensive safeguards to prevent the possibility of employee injury or exposure to hazardous substances." So, robots can make the workplace safer by doing the worst jobs.

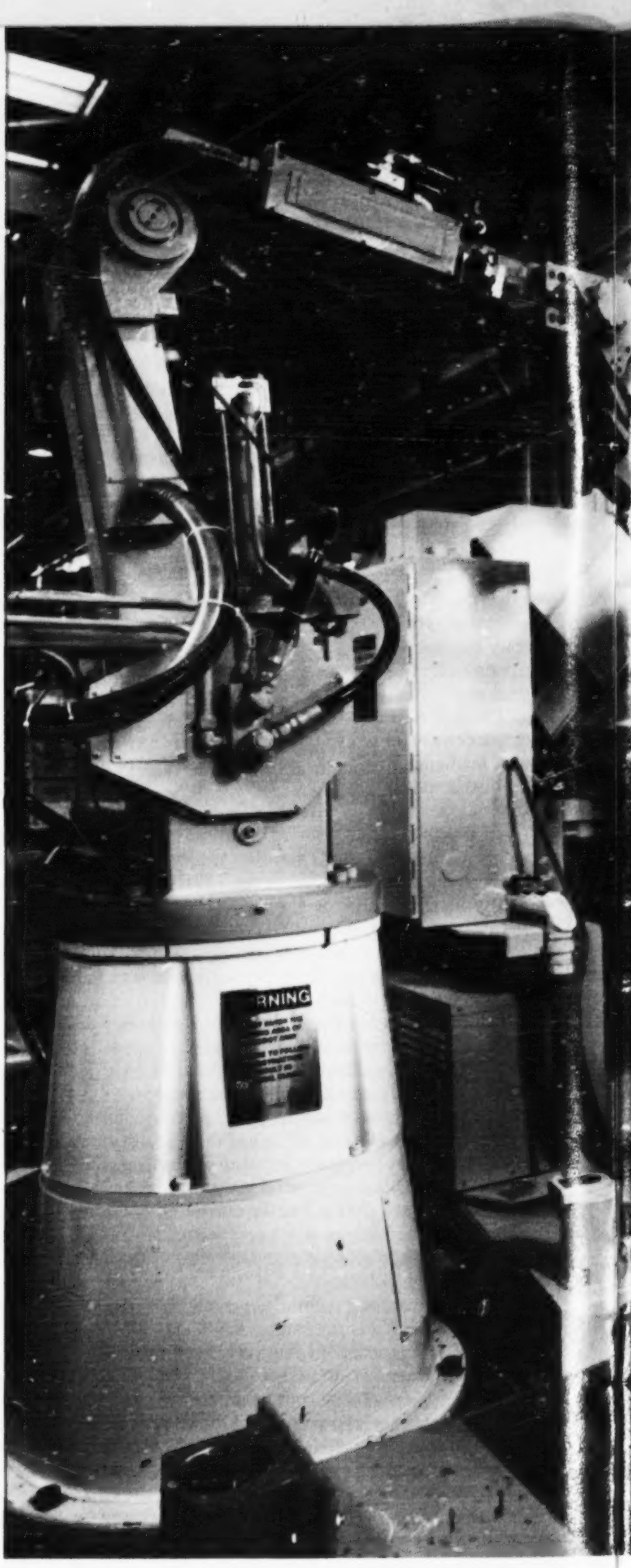
They might also free workers for better jobs. As Beecher says, "The use of robots tends to reduce the number of repetitious, boring jobs and to increase the number of available skilled jobs, particularly in the repair and machine maintenance areas."

Yet even this is not a certain effect. Some see another result of new technology. Russell A. Hedden, president of Cross and Trecker Corp., an industrial equipment manufacturer, says that computer-controlled machine tools can take more and more skill off the shop floor and put it into the computers and machine tools.

Robots have the potential to change the quantity and type of labor demanded by industry. Some analysts suggest that ultimately a work force with a higher skill level will emerge. Speaking at a Congressional roundtable on emerging issues, Thomas Weekly, coordinator of the skilled trades department at the United Auto Workers remarked: "Common sense and simple facts show that automation does replace workers, and though a certain amount of new work is shifted to a skilled maintenance group, the long time effect is a reduction in nonskilled labor."

This is a change that can potentially create problems, since it is the unskilled who are least able to find new work if they are put out of work and the most hard-pressed to enter the labor force, especially in times of limited openings for unskilled workers. Some analysts have suggested that this change, if it comes about, will place an increasingly heavy burden on those least able to cope. In addition, it presents a question of who will provide retraining so that these workers can qualify for potentially more plentiful skilled jobs.

But there is also a possible good side to this change in the proportion of skilled to nonskilled jobs in the economy. Perhaps larger numbers of more interesting jobs will open



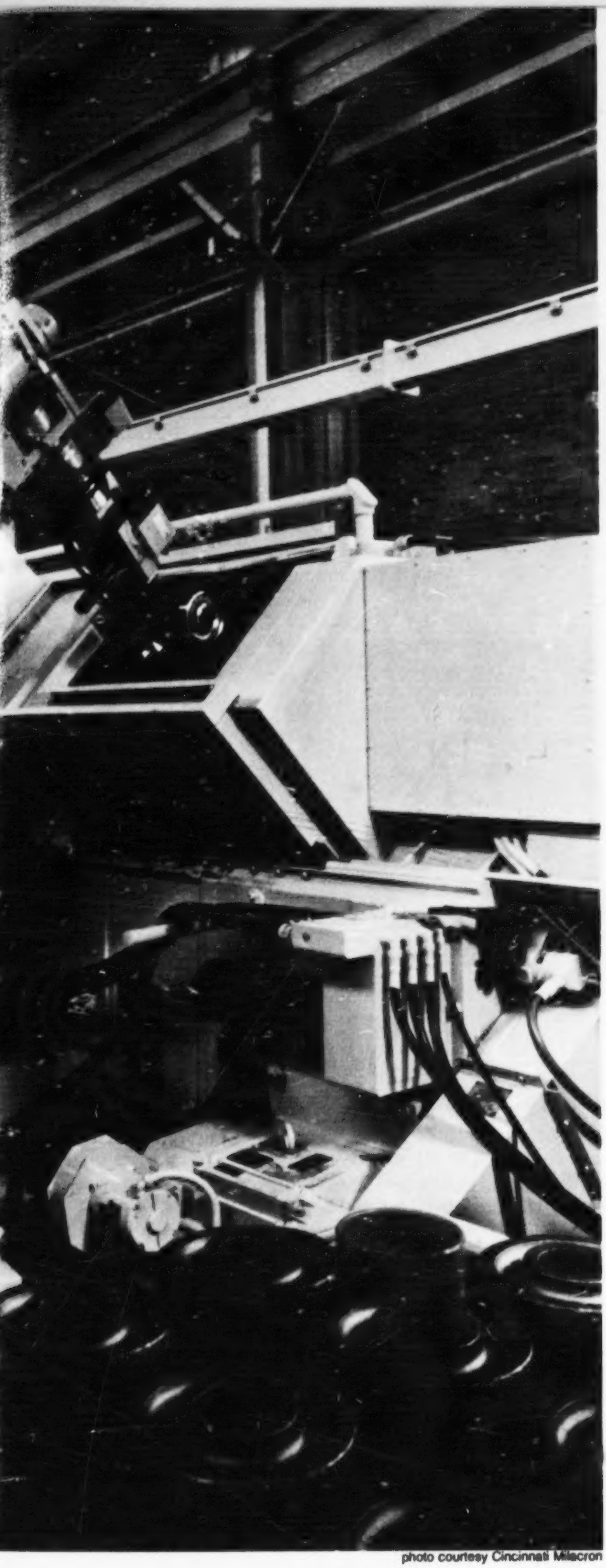


photo courtesy Cincinnati Milacron

up to which certain workers cannot now aspire. For example, a skilled trade worker such as an electrician may be put in charge of maintaining and supervising a robot welder. Hence, the worker's responsibilities are expanded.

Another effect robots and new technology could have on the work force is a trend towards shiftwork, especially in industries not now using shift scheduling. Robotic specialists and maintenance personnel may be expected to be available around the clock if that is when the robots work.

New Occupations in the Robotic Age

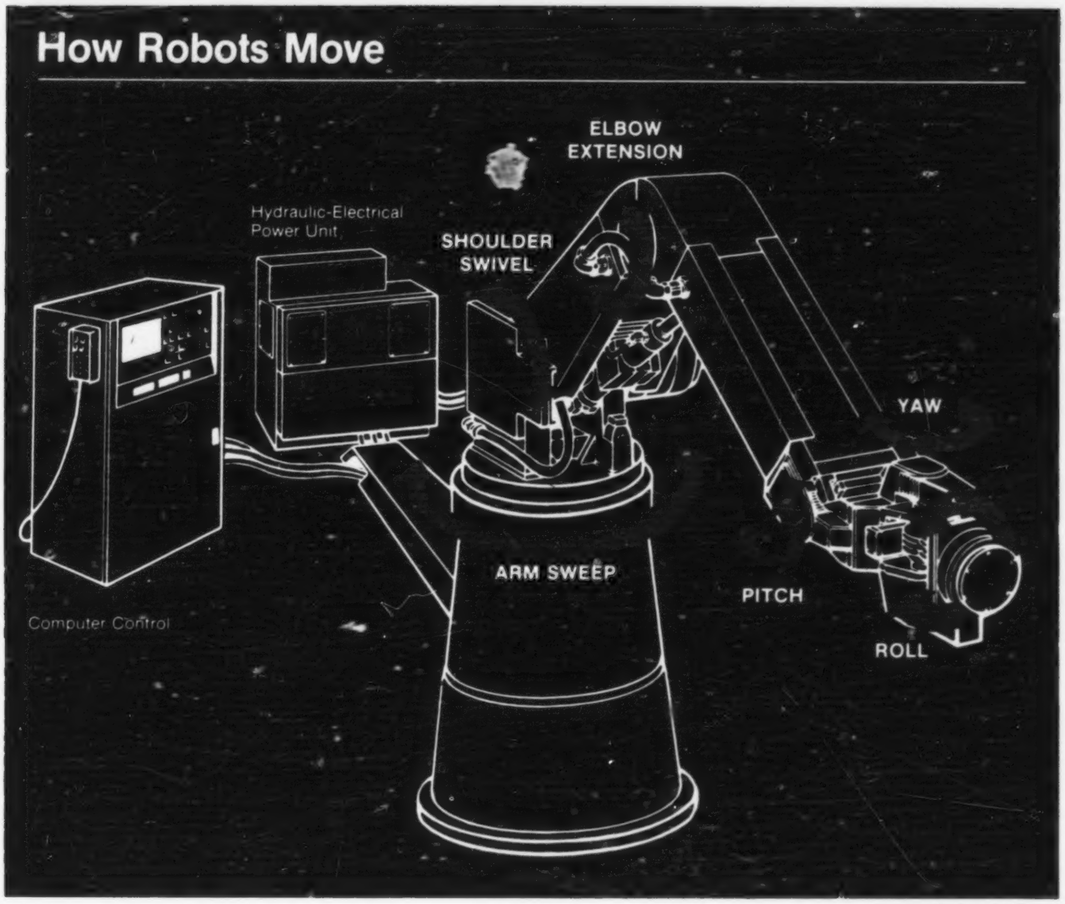
New jobs and new occupations might emerge as a result of the new technology. Analysts generally agree that new jobs will be created with the coming of robots; but, as with potential worker displacement, estimates on what type of jobs and how many will be created is a subject of debate.

The introduction of robots into the workplace will create jobs in the programming, maintenance, and operation of robots. According to Peter Blake, "These will definitely be jobs not previously found on shop floors." Also, the increased use of robotic technology is creating demand for robotics engineers and manufacturing engineers experienced in robotic applications. Engineers with related specialties will also be in demand for research and development of robots by users as well as by robot manufacturers. In addition, successful use of robots in industry will require computer specialists to develop the proper software for applications.

According to Don Smith, Director of the Industrial Development Division of the Institute of Science and Technology at the University of Michigan, robotic maintenance workers will represent the largest number of new jobs. According to the Carnegie Mellon University study, different skills are required for operation and maintenance. While maintenance duties require more extensive retraining, operation or monitoring duties are essentially unskilled and are more easily picked up. The levels and skills required also differ according to the type and complexity of robots.

For persons involved in the operation of robots, elaborate retraining is unnecessary. Almost anyone can be taught to operate a robot with very minimal training. Typically, experienced maintenance people require a week of formal training to adapt their skills to routine servicing and monitoring of robots. Frequently, the robot manufacturers or vendors provide the training programs that give participants the necessary skills to maintain and operate robots. Workers are also often given on-the-job training of several weeks following the training programs. Some of the large robot users, such as General Motors, employ their own training specialists within the plant to insure that their workers have the skills to maintain robots and other types of electronic systems.

More extensive instruction is necessary to learn the skills associated with robot maintenance. Skill requirements in the primary stages of robot maintenance include knowledge of hydraulic valves, basic electricity, numerical controls, and other areas of general plant and machine maintenance. Although some of the courses needed to learn to maintain a robot are very technical, they do not require skills very



How Robots Move

courtesy Cincinnati Milacron

different from those involved in maintaining other pieces of complex machinery, according to the Carnegie Mellon University study. Researchers of the study concluded that anyone who has experience in machine maintenance can be easily retrained to maintain robots.

Besides maintenance workers, programmers are also needed for developing software for robotic applications, and it is expected that computer software specialists for manufacturing systems will be much in demand. "It is in the software instructions that robots represent a state-of-the art development," says David Babson, publisher of the *Babson Weekly Staff Letter*.

In the engineering profession, a new manufacturing engineer will be in demand—the robotics specialist. This engineer must be capable of planning the robot installation of programmable machines, including robots, and the specifications for their capability and work environment and designing the production line around the capabilities of programmable automation.

Besides working on applications for industrial users, manufacturing engineers will be especially in demand at computer companies that enter the robot manufacturing market. According to David Babson, most computer firms, especially those in the mainframe business, have years of experience in software development, but they lack an intimate knowledge of machinery and how factory procedures differ from industry to industry.

New employment opportunities will be found not only in businesses that purchase and use robots but also in robot manufacturing companies. The robot manufacturing industry will employ between 60,000 and 100,000 persons by 1990, based on estimates done for the Society of Manufacturing Engineers. If the robot business expands, businesses that supply products to robot manufacturers will also grow. Robot manufacturers will employ persons chiefly in three areas—machine construction, computers, and software. Engineers will be needed, as well, to design and direct the assembly of robots, as mentioned above. In addition, personnel will be needed to market robots and provide customer services.

Retraining Workers

Probably a more controversial aspect of wide-scale adoption of robotic technology in industry, than even the potential number of workers affected, is worker retraining. Some see worker retraining as a natural and inevitable outcome of the robots' takeover of dull and dirty jobs on the production line. They describe the change in terms of transition rather than disruption. Others aren't so sure it will be that easy for workers. "There will be jobs taken over by the new robots, for that is their very nature. But perhaps the question is whether the robot is displacing or replacing," says Joseph Jablonowski the editor of *American Machinist*, in the November 1981 issue. Calling them "displaced" seems to imply these workers will still have jobs. When workers are displaced, the employer could reassign them to other, similar jobs, or retrain them for new jobs. When they are replaced, they are put out of work with no promises of retraining from anyone.

For those who see the robot coming in to replace workers, the question of who will retrain affected workers looms large. That this is an area of interest to labor is evidenced in the increasing interest of unions in issues concerning new technology. Indeed, Harley Shaiken sees this trend continuing and predicts that new technology will be "one of the central issues in collective bargaining in the 1980's." A comparative survey done by the industrial union department of the AFL-CIO of major collective bargaining agreements in manufacturing and nonmanufacturing in March 1980 shows that 14.1 percent of agreements they surveyed included provisions for worker retraining after the introduction of new technology.

The problem of retraining workers is complicated by the fact that generally the first workers to be displaced will be the most unskilled in the labor force. Dr. William Spurgeon, program manager of production research at the National Science Foundation articulates this dilemma: "Robots are here to stay and their number in factories will increase. People will be displaced. They can be retrained, but for what? Robots displace unskilled or semiskilled persons who don't have much training. What if these people cannot be trained for more skilled jobs? Just to say retraining is much too simple an answer. We need to look deeper than that."

The Carnegie Mellon University study notes that, for the most part, industry is not equipped to deal with the structurally unemployed segment of the work force whose skills will no longer be needed. Workers in this section of the work force include people who have been trained but never hired and unskilled entry-level employees who have been displaced. Says the study, "...Although industry is assuming some of the responsibility for dealing with worker retraining, it cannot be held responsible for dealing with the entire problem of unemployability, especially where basic educational background is inadequate."

Although some companies who are adopting robots are making efforts to retrain displaced workers for new jobs, there have been no surveys done on how widespread these efforts are in industry. So far, most programs to retrain workers to work with robots have been provided by employers in conjunction with robot manufacturers or vendors.

Community colleges and vocational schools are also developing programs to train workers to operate and maintain robots. "Meeting the Demand for Robotics Technicians," published in the Summer 1981 issue of *Robotics Today*, describes a program established at Macomb County Community College in Warren, Michigan, to train robotics technicians. The Macomb program, now 3 years old, was the first of its kind in the country. Similar programs at other educational institutions for retraining of workers could prove useful to both the community colleges and workers.

The Carnegie Mellon University study does suggest one avenue of retraining that can help—vocational education. "Vocational education is another mechanism which has been used to generate the needed training and education to adapt to advanced technology," says the report. This suggestion raises the question of what role, if any, the government should play in recommending or taking action for worker retraining.

Even the business press has become conscious of the potential problems of worker displacement and worker retraining. *Business Week* of June 9, 1980, featured an editorial, "When the Robots Move In," that pointed out that while managers of U.S. industry have begun to realize that robots will take over an increasing number of jobs in the coming decade, they still think of it as a technological challenge rather than as a problem also of retraining and reemploying of workers. "It would be pure wishful thinking," the editorial said, "to assume that the conversion can be made painlessly and that the problem of displaced workers will solve itself. As the robots move in, human workers will have to be retrained and shifted to jobs that do not represent demotions. This is fairly easy to arrange when the robots are taking over only the most dangerous and distasteful jobs in industry. It will be far harder when automation starts replacing workers in light assembly operations."

And to the editors, the solution does not lie solely with government programs or public education. They suggest that "U.S. companies should decide what sort of retraining they can offer and how they can break down and restructure jobs to provide work for those who cannot be reeducated."

Obviously, there are no simple answers to these questions. But, when the business press starts posing such questions, one has to believe there may be real problems behind the concerns. An appropriate observation was made by Hesh Weiner in his review of *Automatic Unemployment* in the *Business and Society Review*. He conjectured: "It appears, for the moment, that the computer, built to answer questions posed by people, has raised some tough questions that people themselves will have to answer." This is undoubtedly true; and perhaps the time to start is now.

EMERGING OCCUPATIONS:

NOT EVERY ACORN BECOMES AN OAK

"What are the emerging occupations, the new, fast-growing jobs?" is one of the most frequently asked questions of people in BLS who analyze occupations. Sometimes the question is put another way: "What will replace the computer industry as the next big growth field?" "What will go from zero employment to a million plus in the next 40 years?"

The question makes a lot of sense. Fast-growing fields offer plentiful opportunities throughout a career, improving chances for promotion and variety in job duties as the years go by. Unfortunately, sensible questions rarely have simple answers. This one is no exception. The answer must begin with a definition of "emerging occupations" and go on to consider how they are discovered. One must also consider whether emerging fields really do hold out the greatest promise for getting on and climbing the corporate ladder.

Spotting Growth Jobs

One study published just a few years ago, "Identifying and Planning for New and Emerging Occupations: A Suggested Guide" (Belmont, Massachusetts: Contract Research Corporation, 1976), defines an emerging occupation as one that has emerged within the past decade, is skilled or technical, has an established demand leading to a basis for projecting growth and a resultant shortage of trained workers, and has no public vocational training programs available. A second, more recent study, "Curriculum Development Needs for Vocational Education: New and Changing Occupations," by Mollie N. Orth and Jill Frymier Russell (Columbus, Ohio: Ohio State University, the National Center for Research in Vocational Education, 1980), defines these occupations as ones that are needed nationally; have become identifiable in the past decade; and have developed as the result of the creation of new industries or occupations (for example, the computer industry), a significant restructuring of existing occupations (for example, physician's assistant), and the modification of required skills in existing occupations (for example, word processing). Put more simply, an emerging occupation is one that no one used to work at, a few people work at now, and lots of people will work at soon.

Such occupations, given the pace of technological development, are numerous. They are also fairly easy to identify. One begins by reading the available material on occupations, paying special attention to social and technological trends that may have a major impact on some jobs. Once the titles of occupations have been determined, one can discuss them with experts for the industry in which they are found. Precise, quantifiable information is not often obtainable, but general trends can frequently be determined.

Each of the two studies mentioned examines several occupations in some detail. These and other job titles are listed in the accompanying box, "Some Emerging Fields and Occupations."

These lists would seem to offer something for everyone. Here are plenty of occupations requiring a variety of skills, all of which are expected to grow rapidly in the near future. But the idol has clay feet, a fly is in the ointment, and a snake is in the grass. Over the next 10 years, none of these fields is likely to provide as many new jobs as occupations such as secretary, nurse, and auto mechanic.

The relatively small number of openings in emerging occupations is not their only drawback. Some of them might actually lead to dead-end jobs. Furthermore, many of them are also simply subspecialties of old occupations. For example, a tumor registrar is a medical records technician who deals with a single type of disease. Such subspecialization also characterizes more technical occupations. Laser/electro-optics technicians, according to "Curriculum Development Needs," should have a formidable array of skills, among which are the following:

- Troubleshoot and repair laser systems;
- perform alignment procedures on optical systems, especially those involving lasers and related optics;
- operate laser systems, including intracavity modulation and O-switching devices;
- utilize basic laser and electrical safety practices in the laboratory.

However, most of the skills needed by a laser/electro-optics technician are also possessed by other electronics technicians or engineers; for example, the ability to perform tests and measurements using electronic devices and the ability to prepare and read shop drawings and schematics are also among the skills specified in "Curriculum Development Needs" for these workers. In other words, a laser/electro-optics technician can be viewed as an electronics technician who specializes in a particular kind of equipment. By the same token, one can isolate technicians who specialize in radar equipment or telecommunications. The point is not to disregard the emergence of the laser/electro-optic specialty; rather it is to emphasize the electronics technology field as a whole, a field that is growing faster than average.

Herbert Bienstock, formerly a regional commissioner for BLS, recently made a similar point in "New and Emerging Occupations, Fact or Fiction?" an address he made to the staff of the National Center for Research in Vocational Education at Ohio State University. Toward the end of his address, Dr. Bienstock made the following comments:

"We have spent a great deal of energy in this country in the last 35 to 40 years looking for the new and emerging occupations. At the same time though, our real challenge has been improving the skills of people for the great array of jobs that already exist. Of course it is important for the researchers in the field to keep an eye on the new occupations and activities. I am not suggesting that we ignore the issue of new and emerging occupations. However, let us not be so overwhelmed that we believe they should be the major focus of our planning."

Identifying emerging occupations is an important activity that can highlight what is happening to the economy in general. Even more important, however, is the awareness that these occupations will not all become major employers of workers and that none of them is a major employer now.

SOME EMERGING FIELDS AND OCCUPATIONS

The following occupations are studied in "Identifying and Planning for New and Emerging Occupations":

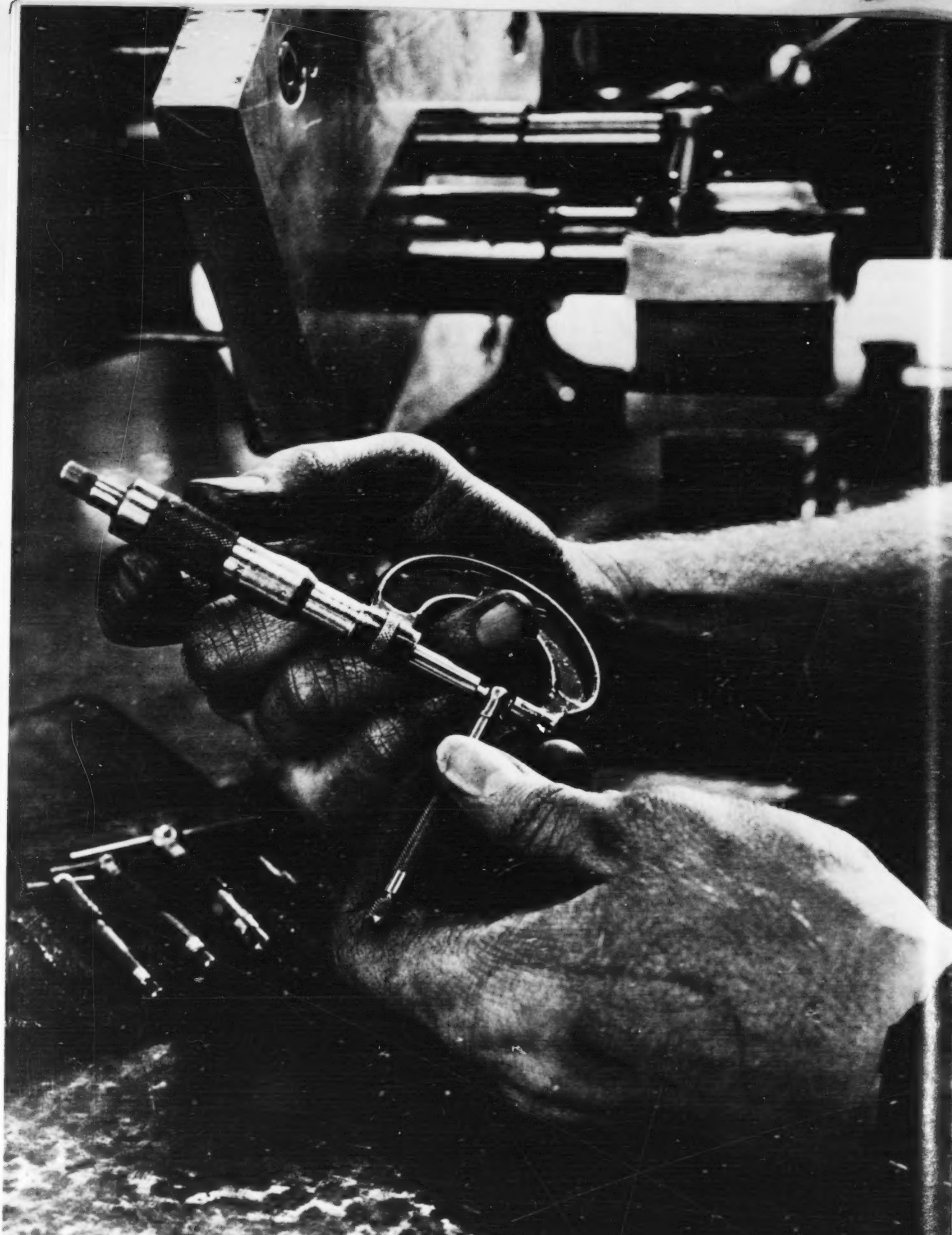
- Child advocate
- crystal manufacturing occupations
- energy efficiency technician
- halfway house resident manager
- horticultural therapy aide
- housing rehabilitation specialist
- industrial hygiene technician
- nuclear quality assurance inspector
- physical security technician
- podiatric assistant
- public safety communications operator.

The following occupations are studied in "Curriculum Development needs for Vocational Education":

- Case manager for the mentally disabled
- energy-related occupations
- housing rehabilitation specialist
- laser/electro-optics technician
- microprocessor-related occupations
- tumor registrar.

The following occupations are mentioned in various studies or lists of emerging occupations:

- Clinical arrival technician
- computer-assisted design worker
- computer-assisted manufacturing worker
- deep sea diving and life support technician
- dialysis technician
- fiber optics worker
- geriatric and gerontological technician
- histological technician
- robotics occupations
- surgical technician
- therapeutic recreation technician.



MACHINIST SHORTAGE

A Look at the Data

by Neal H. Rosenthal

Employers need more machinists, but how many more is hard to tell.

During the past few years, many articles dealing with current and expected shortages of machinists have been published in national periodicals. Because machinists play a significant role in production, these articles have raised concerns about the ability of American industry to function efficiently. Major issues stemming from these concerns are the ability of American industry to contend with a major defense buildup and the loss of work to foreign countries where more labor is available.

The basic conclusions presented in most articles are generally consistent: Employers currently are not able to hire as many skilled machinists as they would like; and not enough training is currently offered to alleviate shortages. In addition, most studies conclude that similar conditions have existed for some time and are likely to continue unless some action is undertaken. A different conclusion, however, results from studies concerning the future of robotics, the expanding use of computer numerically controlled (CNC) machine tools, and other technological innovations. These studies generally conclude that the need for manual labor in factories, especially for highly skilled machinists, will be reduced significantly in the future.

Because of the different viewpoints of these studies, it is not clear what the future holds in the way of supply-demand conditions for machinists. Furthermore, very little of the statistical information used to present either viewpoint is based on what economists and statisticians would call "hard data." Much of the information is obtained in surveys that have questionable statistical reliability. However, statistically reliable data are not available. Existing Federal programs do not collect data on current shortages of workers in specific occupations, and information about future occupational shortages is very limited.

This article attempts to clarify some of the issues about the current and future labor market for machinists through an analysis of the limited statistical data available. These data do not cover all of the subjects that would be helpful in an analysis of supply-demand conditions. Nevertheless, summarizing and analyzing a wide variety of data provide insights into the issue.

Definitions and Data

Shortages. Data are often misused or misinterpreted because the definitions of terms are not specified. *Shortage* as used here means that sufficient workers are not available and willing to work at the existing wage. Traditional economic theory, which states that rising wages increase supply because more workers will seek jobs, is consistent with this definition. However, if acquiring the required skills takes a significant amount of time and no additional workers with the required skills are available, supply cannot be met in the short run. Under these conditions, wages can be expected to rise as employers hire trained workers from each other, overtime is used to meet production schedules, and more workers with less than the desired skills are used. These factors are likely to raise prices and reduce productivity.

In addition, employers would likely raise wages for trainees in an attempt to attract qualified workers into machinist training programs and thereby reduce shortages in the future. Wages, however, are not the only factor affecting career choice. Other factors, such as working conditions, social status, chances for advancement, and personal abilities and preferences, all affect a person's choice of a career.

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The job market for an occupation is very complex. Workers employed in a specific occupation may shift to another occupation, die, or retire. Some may change jobs by changing employers but remain in the same occupation. Some workers lose their jobs and become unemployed. Most occupations also have several skill levels, and workers can change jobs within the same occupation by moving up the skill ladder. At the same time that workers leave an occupation or change jobs within it, other workers enter the occupation. They may come from outside the labor force—including new workers and workers who are returning to work after raising a family, pursuing additional education, or retiring for a short period. Entrants also may come from workers in another occupation or from the ranks of the unemployed. All these situations exist in machining occupations, but available data do not quantify them accurately.

Machinists. The word *machinist* is as much in need of definition as *shortage*. For example, the occupational titles "machinist," "machining occupations," and "metalworking occupations" often mean different groups of workers but are sometimes used interchangeably. Furthermore, because consistency in occupational definitions does not exist among all statistical programs, some people discussing machinists unknowingly use data that do not refer to the group of workers they call "machinists."

To avoid confusion, this article uses the same definition of machinists as the Current Population Survey (CPS), the most complete single source of data about employment and unemployment trends for workers in machining occupations. In the CPS, machining workers are classified in two groups by skill level—skilled workers and operatives. Among skilled workers, three occupations are identified separately—machinist, tool-and-die maker, and job- and die setter. Among operatives, five machining occupations are identified—drill press operative; grinding machine operative; lathe, milling machine operative; punch stamping press operative; and other precision machine operative.

It should be pointed out that CPS statistics are compiled as if there were a clear break in skills between occupations rather than a continuum within each category. For example, a lathe operation in one shop might not require as much skill as a lathe operation in another firm, but the CPS will not reflect this. Furthermore, each CPS job title stands for a large number of employers' titles. For example, the skilled occupation titled "tool-and-die maker" in Current Population Surveys conducted from 1972 to 1980 includes 35 separate job titles, including diemaker, die sinker, jig-bore-tool maker, tool adjuster, and jig and fixture builder.

Machinists in the 1970's

Combined employment in the three skilled machining occupations covered separately in the CPS increased from 655,000 to 834,000 between 1972 and 1980, an increase of 27 percent. (See table 1.) In comparison, employment in manufacturing industries, where most of these workers are employed, grew

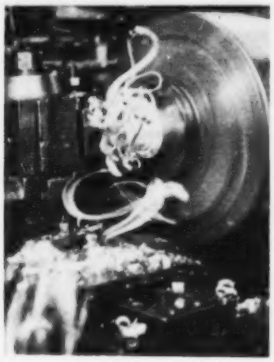


Table 1. Employment in machining occupations, 1972-80

(Numbers in thousands)

Occupation	Annual averages								
	1972	1973	1974	1975	1976	1977	1978	1979	1980
Skilled machining occupations, total	655	682	735	731	758	768	773	824	834
Job and die setters, metal	94	93	97	96	92	97	98	90	91
Machinists	377	402	461	461	478	478	493	552	567
Tool-and-die makers	184	187	177	174	188	193	182	182	176
Operative machining occupations, total	625	595	601	489	508	524	542	562	502
Drill press operatives	75	77	69	61	65	62	64	67	61
Grinding machine operatives	130	140	152	132	133	126	129	143	134
Lathe, milling machine operatives	123	136	137	118	106	121	125	123	114
Punch stamping press operatives	157	175	170	130	155	152	156	158	127
Other precision machine operatives	140	67	73	48	49	63	68	71	66

Source: Current Population Survey.

Table 2. Ratio of earnings of workers in selected machining occupations to all production workers, 1972 and 1980, selected Standard Metropolitan Statistical Areas

Area and occupation	Ratio	
Boston		
Machinists	1.47	1.22
Machine tool operators	1.43	1.12
Chicago		
Machinists	1.31	1.32
Tool-and-die makers	1.41	1.39
Machine tool operators	1.28	1.30
Houston		
Machinists	1.29	1.23
Tool-and-die makers	1.17	1.15
Baltimore		
Tool-and-die makers	1.32	1.31
Machines tool operators	1.15	1.14
Cincinnati		
Tool-and-die makers	1.30	1.26
Machine tool operators	1.24	1.17

Source: Bureau of Labor Statistics. Based on data from the Area Wage Surveys and the Current Industry Employment Statistics Program.

only 6 percent during the same period. Machinist employment alone grew from 377,000 to 567,000, or 50 percent; but the two other skilled machining occupations declined slightly.

Employment in each of the operative machining occupations declined between 1972 and 1980 or remained at roughly the same level. For these occupations as a group, employment declined by an average of 15,400 a year during this period.

During the 1970's, the unemployment rate for the skilled machining occupations was lower than the rate for durable goods manufacturing as a whole, in which over 80 percent of all skilled machining workers are employed. Unemployment rates for machinists and tool-and-die makers were lower than those for craft workers as a whole each year from 1972 to 1980. Unemployment rates for operative machining occupations, however, were generally higher than average.

Earnings data for machinists, tool-and-die makers, and machine tool operators are collected through the BLS Area Wage Surveys. The definitions for machinists and for tool-and-die makers used in these surveys are not identical to those in the CPS. They are comparable, but the skill level of the machine tool operators for which wage data are collected is much higher than the skill of the average worker reported in operative machining occupations in the CPS.

Within a given metropolitan area, the hourly earnings of machinists, tool-and-die makers, and machine tool operators as reported in the BLS Area Wage Surveys differed only slightly for each year for which data are available during the 1972-80 period. In general, in these areas, tool-and-die makers earned slightly more than machinists, who in turn earned slightly more than machine tool operators. For each occupation, there were some significant earnings differentials between cities.

One way to compare an occupation's wage with the wages of other occupations is to express it in terms of a ratio. Table 2 shows the ratio of wages of various machining occupations to the wages of all production workers in five cities in

1972 and 1980. Between 1972 and 1980, the wages of workers in the machining occupations relative to all production workers remained the same or declined slightly in the five cities for which data are readily available.

Training data for machinists are sketchy. Completions of registered apprenticeships declined markedly between 1970 and 1980 for machinists, going from 3,822 to 2,450 in one year, 1975, only 1,905 completions were reported. A similar pattern is shown for tool-and-die makers.

Implications of the Data

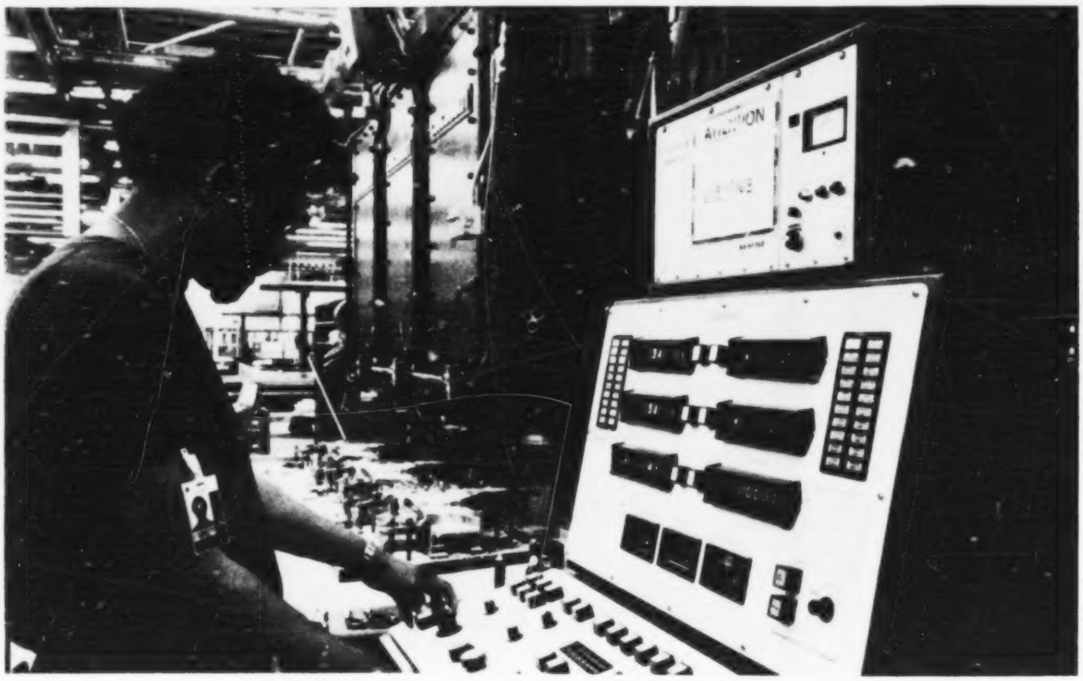
The data presented above do not prove or disprove that shortages of machinists exist. The very low unemployment rates for skilled machining workers during the 1970's are compatible with a shortage of workers. It would be unlikely that there were shortages of machinists if their unemployment rates were high. Equally, it is unlikely that general shortages of machine operatives existed during the 1970's because their unemployment rates were relatively high. During some years, however, unemployment rates were very low for some operative occupations, indicating a possibility that shortages existed.

Unlike the data on unemployment, the data on earnings of machining workers do not show a pattern that would, in theory, be expected with the existence of shortages. The wages of machinists relative to those of all production workers did not change significantly.

Trends in apprenticeship programs should be expected to shed some light on the job market for machining workers because apprenticeship training is provided by employers. During periods of shortages or expected shortages, employers should be willing to expand training. Although employers would have to bear the costs of training, it would be worth it to them if they would then have a trained work force. During the 1970's, however, apprenticeships actually decreased, implying that shortages did not exist or that they were not severe enough to warrant increased training on the part of employers. However, enrollments and completions of nonregistered programs do not show up in Federal statistics and may have increased.

At least one other indicator of a shortage of machinists is available. As indicated earlier, specific data designed to measure occupational shortages are not compiled through Federal statistical programs. A survey of job vacancies in Massachusetts, conducted as part of a pilot program to see if such data could be collected accurately by occupation, points to a shortage of machinists—at least in that State. The job vacancy rate (vacant jobs divided by total employment) for machinists in Massachusetts was 13.3 percent in 1979 and 12.5 percent in 1980, higher than for any other occupation. Other occupations with high vacancy rates (over 4 percent in each year) were mechanical engineer, computer scientist, registered nurse, licensed practical nurse, and computer programmer. These occupations are frequently placed in the "shortage" category, and it is notable that the vacancy rate for machinists was much higher.

Journal articles analyzing shortages of machinists often state that machinists



as a group are aging. Data on the age distribution of machinists and job-and-die setters collected in the CPS dispute this conclusion. For example, between 1972 and 1980, the proportion of these workers who were 55 to 64 years of age actually declined, and significant increases were recorded in the 20-to-24 and 25-to-34 age groups. The increase in the younger age group followed the trends in the total population and for craft workers as a whole.

Implications for the 1980's

Because machining workers are essential to many types of industrial production, economic and industrial planners are very concerned about the future job market for these workers. The issue is particularly important to those concerned with the capability of U.S. industry to cope with a major defense buildup. Some insights into this topic can be obtained from projections of employment in machining occupations developed by BLS as part of its economic and employment projections programs.

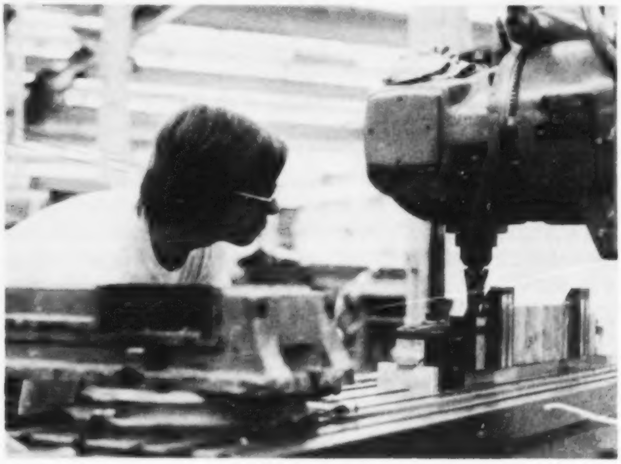
BLS developed three alternative projections of employment in 1990 in which growth of employment for skilled machining workers ranged from an average annual increase of 11,900 to 23,200 a year from 1980 to 1990. In all three models, the rate of growth of employment is expected to be slower than in the 1970's, and only in the high-trend model is the 1980-90 numerical average annual growth similar to the level of the 1970's. Factors such as labor force growth, productivity, and the assumed unemployment rate changed from model to model. The assumed increase in defense expenditures varied little, being rapid in all three models.

Summary

Some information about the job market for skilled machining workers during the 1970's is consistent with the existence of shortages. However, statistics generated by ongoing data collection programs do not provide the information necessary to quantify the shortage. The statistics that quantify shortages based on data collected through surveys conducted by employer associations are statistically unreliable and probably overstate the numerical shortage.

General shortages of skilled machinists should not get significantly worse during the 1980's. However, it is possible for shortage conditions to become very severe in some localities. For example, if a major increase in defense purchases were to occur in a short time in a specific locality, the shortage could become so acute that production could not increase as planned.

In general, however, unless programs are designed to foster action on the part of employers, current shortages are not likely to be reduced significantly. The two methods of reducing shortages, implementing technological improvements and expanding training, are very expensive. Many skilled machinists are employed by small firms that cannot afford to purchase new equipment or expand training under current conditions. Thus, some specific program would be necessary to expand the rate at which new technology is introduced or to increase the number of workers trained each year. OOQ



BLS' 1970-80 Projections: How

It has been suggested that if you can make three correct guesses consecutively, you have established yourself as an expert; and if the correct guesses happen to apply to economics, that makes you an expert economist.

Unfortunately, getting three correct guesses about future economic activity can be difficult, and accuracy of past predictions is not typically an economist's favorite topic of conversation. The lessons learned in evaluating the accuracy of past projections, however, can be helpful in strengthening projections made in the future. With this in mind, the Bureau of Labor Statistics periodically checks back on the accuracy of its occupational projections.

Note, however, that the word *projections* is used. The Bureau has always emphasized that its projections are not predictions. Using information on the demand for goods and services, advances in technology, changes in business practices, and other factors, economists estimate the number of workers who will be employed in an occupation *if past trends continue*. To make these estimates, they also must make some *assumptions about the future*. Common assumptions are that there will be no war, that unemployment will not exceed a specific level, and that our system of government and basic social values will not change. If the assumptions are wrong, the job outlook could be too.

How accurate are the Bureau's projections? The latest assessment, "Evaluating the 1980 Projections of Occupational Employment," by Max L. Carey and Kevin Kasunic, appeared in the July 1982 *Monthly Labor Review*. The following analysis is based upon this article.

Occupational Groups

Employment projections for 1980 were published in 1971 and appeared, among other places, in the 1972-73 edition of the *Occupational Outlook Handbook*, the Bureau's career guidance publication. A comparison of projected employment change and actual change between 1970 and 1980 showed that the Bureau correctly projected the direction of change in employment in each major occupational group except nonfarm laborers and operatives. The projections also correctly established that professional and technical workers, service workers, and clerical workers would be the three fastest growing occupational groups.

Generally, differences between projected and actual employment levels were quite small for each of the groups for which the direction of change was projected correctly. An exception was managers and administrators, which grew twice as rapidly as projected, resulting in a 1.4 million underestimate of employment in 1980, which turned out to be 10.9 million. Analysts were misled by the slow increase of the group during the early 1960's.

Analysts thought the number of nonfarm laborers would decline slightly between 1970 and 1980 and that operatives (comprising occupations such as machine tenders and assemblers, for example) would grow. They were wrong on both counts.

Laborers increased by almost 20 percent. As was the case for managers and administrators, projections for this group were too strongly influenced by trends in the employment of laborers during the 1960's, when growth was at a standstill.

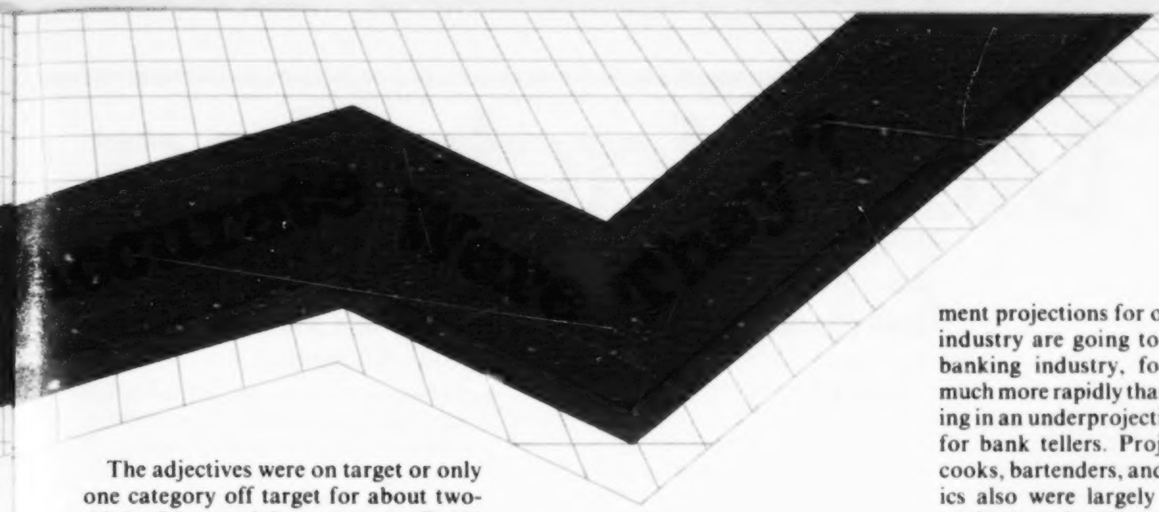
The 1.6 million overestimate of operatives was the largest numerical error for a major occupational group. Still, the rationale behind the projection was sound. Operatives are concentrated in manufacturing industries, which are sensitive to economic fluctuations. After recovering from the recession of the mid-1970's, employment of operatives grew steadily and might have reached the projected level if the economy had continued to improve. Employment was up to 14.5 million in 1979, but dropped back to 13.8 million in 1980, as the economy felt the effects of the 1979 oil-price shock.

Handbook Statements

Mostly because of changes in occupational definitions, only 34 of the occupations appearing in the 1972-73 edition of the *Occupational Outlook Handbook* could be analyzed for projected and actual employment change between 1970 and 1980. Most jobs covered in the *Handbook* contain a sentence describing whether the job will grow or decline in the years ahead. The adjectives used in the 1972-73 *Handbook* to describe expected changes in employment requirements during the 1970's generally correspond to the ranges of change shown below:

	Percent change	
Descriptive adjective	**Increase**	**Decrease**
Very rapid	40.0 or more	-40.0 or more
Rapid	30.0 to 39.9	-30.0 to -39.0
Moderate	15.0 to 29.9	-15.0 to -29.9
Slow	5.0 to 14.9	-5.0 to -14.9
Little or no change	0 to 4.9	0 to -4.9

Of the 34 *Handbook* statements that could be analyzed, only two, elementary school teacher and telephone operator, incorrectly projected the direction of employment change. The *Handbook* said employment in this teaching field would decline slowly, but it showed little or no change. The number of telephone operators was expected to grow slowly instead of declining moderately. The outlook description for telephone operators was misleading, but the one for elementary school teachers was not.



The adjectives were on target or only one category off target for about two-thirds of the remaining statements. Rapid growth in employment of surveyors was projected, for example, instead of very rapid growth. Adjectives for about one-fourth of the statements were off by two categories, but in some cases it is difficult to determine whether this degree of inaccuracy was misleading. The difference between moderate growth and very rapid growth, for example, does not seem as significant as the difference between moderate growth and little or no change. Adjectives for the following occupations were three categories off: Jewelers and watchmakers, boilermakers, and cement and concrete finishers. The outlook descriptions for these occupations likely were misleading.

A Broader Perspective

The Bureau prepares employment projections for more jobs than appear in the *Occupational Outlook Handbook*. Projections were made for 160 detailed occupations in 1971; but, again mostly because of changes in definitions, only 64 were sufficiently comparable for evaluation. How accurate were the 1970-80 projections for this larger group of 64 occuptions?

The direction of employment change between 1970 and 1980 was correctly anticipated for 50 of the 64 detailed occupations. Although the direction of the change was typically correct, the magnitude of the projected increase or decrease was sometimes off target considerably. Overestimates and underestimates were about equally common. Among the occupations in which employment was overstated by more than 50 percent were photoengravers and lithographers, patternmakers, airplane mechanics, telephone operators, and credit managers. Employment in several occupations was underprojected by more than 30 percent, including cooks, bartenders, bank tellers, lawyers, and roofers.

In analyzing projection data on the 64 occupations, several patterns were apparent:

- The larger the occupation, the more accurate the projection was likely to be. Less than one-sixth of the occupations with more than 50,000 workers in 1970 had projections that were in the wrong direction, while more than one-third of the smaller fields had that mistake. Sampling errors diminish relatively as employment size increases, so the historical data for large occupations would be expected to provide more reliable trends to use in developing the projections.
- Target-year employment usually was underestimated in the fastest growing occupations and overestimated in those with the slowest growth. Occupations with the most rapid growth generally had the largest projection errors.
- Many of the larger errors in the size of the projected employment change in an occupation resulted from poor estimates of industry-occupational staffing patterns. The decline in the ratio of telephone operators to total employment in the telephone industry, for example, was greater than anticipated, and, consequently, the demand for workers in this occupation was overprojected. Staffing pattern estimates also led to large errors in the projections for locomotive engineers' helpers, psychologists, credit managers, lawyers, and roofers.
- Poor estimates of industry employment totals, rather than staffing patterns, however, were the primary causes of large errors for some occupations. If an industry is growing faster than anticipated, chances are employment projections for occupations in the industry are going to be too low. The banking industry, for example, grew much more rapidly than expected, resulting in an underprojection of the demand for bank tellers. Projection errors for cooks, bartenders, and aircraft mechanics also were largely a result of poor projections for the industries in which these workers were concentrated.

New Projections

Since the 1980 projections were published, the Bureau has taken steps to improve its occupational outlook program. A new Occupational Employment Statistics (OES) survey has been completed, and projections to 1990 have been developed. Previous projections were based largely on census data showing trends in staffing patterns from decade to decade. Because census data are collected only once every 10 years, they do not capture the latest developments in occupational employment requirements in different industries. The new OES survey provides much more timely information, since data are collected on a 3-year cycle. The OES survey also is more specific in its definition of occupations.

The 1980 projections were based on a single set of assumptions. Three alternative versions of occupational projections have been published for 1990, each based upon a different set of assumptions about such factors as growth of the Nation's labor force, production, and productivity. Although many users of job outlook data may prefer a single projection, the Bureau has concluded that single estimates inevitably cause users to attribute too much precision to them. Alternatives also are of more value to planners who are concerned with how differences in the assumptions might affect demand in an occupation if economic conditions change. The results of the Bureau's 1990 projections were summarized in "The Job Outlook In Brief," which appeared in the Spring 1982 *Occupational Outlook Quarterly*. Projections for more than 200 jobs are presented.

Manufacturing Engineering

by Gail M. Martin

photo courtesy General Electric

Manufacturing engineer Garnet Hizzey is heading up a team that's working on an engine support for a new version of the Boeing 737. The support must be short, dense, and strong. The size will present problems in assembly; the strength requirements demand that it be made of composite materials that meet rigid specifications.

To overcome design and production problems, engineers from the design, tooling, materials, quality control, and fabrication departments of the company work cooperatively under Hizzey's direction. The multifaceted nature of this task, typical of those in industry today, demands an interdisciplinary approach that makes the manufacturing engineer the logical leader of this design engineering team.

Manufacturing engineers develop and coordinate production methods to transform conceptual designs into manufactured products in the most efficient manner. They have worked in industry for a long time. Some are known by the specialties in which they trained—mechanical, industrial, or environmental engineers—but others are now recognized and called manufacturing engineers. According to Mark Stratton, education director for the Society of Manufacturing Engineers, "By definition, manufacturing engineering is a multidisciplinary field that covers mechanical, industrial, and even environmental engineering."

The job of the manufacturing engineer has grown by leaps and bounds with the introduction of industrial robots, computer-aided manufacturing (CAM), and computer-aided design (CAD). In addition, the manufacturing engineering profession has taken on greater importance as manufacturing firms seek solutions to problems of spiraling energy costs, competition from foreign manufacturers, and lagging pro-

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ductivity. Increasingly, manufacturing companies are turning to manufacturing engineers for some solutions to these difficulties.

Manufacturing Engineers on the Job

No two manufacturing engineering jobs are exactly alike. For this reason, manufacturing engineers must be practical "can-do" specialists who are more concerned with applications than with theoretical engineering. There are about 140 basic manufacturing processes and about 40,000 materials used in manufacturing industries today. The challenge of the manufacturing engineer is to work with these combinations, deciding what equipment might be used for making particular products and the materials that are best suited for each application.

In deciding what process to use, the manufacturing engineer develops the work standards. If two parts are to be welded together, for example, the time required to perform the welding operation must be standardized in order to compute the labor requirements and production costs.

Besides work standards, manufacturing engineers develop many other standards, including machine tooling standards. Machine tools include radial drill presses, lathes, milling machines, shapers, and grinders. These machine tools must be both designed and produced to certain standards. Tooling also must be technically sound and priced right. The manufacturing engineer decides whether the company will do its own tooling or buy it. In certain cases, it's always advisable to buy. For example, manufacturing cutting tools is highly specialized technology that is beyond the ability of most companies. The manufacturing engineer, then, must be well-versed in all of the options when specifying tooling standards in order to choose the most economical and practical alternative.

In process engineering, the manufacturing engineer plans the step-by-step sequence of production. This plan, called a process sheet, assures that the overall product is subdivided into individual components and subassemblies for production. The manufacturing engineer completes the production plan by deciding on a sequence of manufacturing steps that are expedient and economical.

Besides developing and implementing standards, the manufacturing engineer becomes involved with plant engineering. Planning the way to handle material is a part of this function. The difference between efficient or inefficient movement of parts and materials through the plant is often the difference between profit and loss. In some cases, the manufacturing engineer solves material handling problems by suggesting changes in the product's design.

Plant enginering also entails facilities engineering. In this capacity, the manufacturing engineer supervises the installation of new equipment, such as machine tools, production equipment, or spray paint booths, to insure that all are properly positioned and that the "startup" date will be met. The cost of failing to meet this date can often be measured in thousands of dollars per hour.

Even before the energy shortage, manufacturing engineers often developed cost trends of energy consumption. This aspect of plant engineering involves investigating potential savings in energy use and pinpointing waste. The manufacturing engineer analyzes utility bills that extend over long periods of time for clues regarding energy consumption as it relates to the production processes used.

The administrative and financial control duties of the manufacturing engineer have become as important as the engineering duties.

The manufacturing engineer develops and coordinates a comprehensive production schedule and ensures that it is met. A missed production schedule could mean a missed opportunity in the marketplace for the company.

The manufacturing engineer also coordinates an overall cost reduction program throughout the plant. To do this, the manufacturing engineer studies trend charts and develops a budget. Sometimes, reducing costs requires equipment or facility modification.

At times, the manufacturing engineer becomes involved with research that

photo courtesy General Electric

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photo courtesy IBM

culminates in new products or processes. Research is an essential activity for all manufacturing companies that are interested in maintaining a competitive edge. For this reason also, it is crucial that the manufacturing engineer keep up with developments in the field as well as work on developing new applications.

Increasingly, manufacturing engineers are introducing changes to improve the work environment. At some establishments, they are designing factory jobs that provide greater worker satisfaction. In some cases, this means employing robots to do jobs that are boringly mechanical to humans. Using robots may also serve to remove people from extremely hazardous work environments, thus meeting another responsibility of the manufacturing engineer: Making the workplace safe from mechanical and health hazards.

Finally, product liability has become an area of prime concern for manufacturing companies, so manufacturing engineers have added meeting legal requirements to their list of job responsibilities. Sometimes new procedures must be adopted to change or improve a product. Some manufacturing engineers not only become involved in redesigning engineering processes but also participate in litigation and testify before investigative bodies.

Manufacturing Engineers Up Close

If the duties of the manufacturing engineer sound similar to those of other engineers it may be because many of the duties of the manufacturing engineer parallel or overlap those of the industrial, mechanical, or environmental engineer. For this reason, engineers educated in these disciplines often work as manufacturing engineers but don't always call themselves by this title.

The Society of Manufacturing Engineers (SME) surveyed 6,600 of its members to obtain information on the manufacturing engineering profession. "The Manufacturing Engineer: Past, Present, and Future" was completed in 1979 by Battelle/Columbus Laboratories. According to the report, nearly all manufacturing engineers surveyed work for private employers, although a small number are employed by the Federal Government, educational institutions, or organizations engaged in research. The principal industrial sectors in which respondents worked included manufacturing of fabricated metal products (21 percent), machinery (14 percent), transportation equipment (12 percent), and miscellaneous manufactured products (10 percent).

By far, the great majority of manufacturing engineers in the work force today have been trained in other disciplines or on the job. In the past, the typical manufacturing engineer was a machinist or mechanic who rose through the ranks to a management job at the plant. But, as technology became more sophisticated, manufacturing engineers needed more specialized, formal education. According to the SME report, the trend toward more formal education for manufacturing engineers will accelerate, and the value of apprenticeship programs for obtaining technical training will diminish in the years ahead. Nearly half of the manufacturing engineers who responded to the survey cited above had bachelor's or higher degrees as compared to only one-third in a similar study 10 years earlier.

Even though more manufacturing engineers in the survey were college educated, the need for manufacturing engineers has not been met by new graduates in this field. The demand for manufacturing engineers, at least during the 1990's, will have to continue to be met by graduates of related engineering disciplines and upgraded technicians because the number of degrees awarded in this field is quite small. According to the Engineering Manpower Commission's 1980 annual survey of enrollments in engineering, only 88 students were enrolled full time in manufacturing engineering or technology programs, and only 22 were full-time graduate students. This number is low partly because only a few schools offer degree programs in the field. For information on these schools, see the box that accompanies this article.

There is definitely more than one way to enter the manufacturing engineering profession; manufacturing engineers have entered through a variety of routes. Since the trend is toward more formal education for manufacturing engineers, the best route for someone interested in entering the field may be to graduate with a bachelor's degree in an engineering discipline. Employers have recruited engineers trained in several engineering disciplines.

All engineers, including those educated in manufacturing engineering or manufacturing engineering technology, undergo a learning period when first employed. While graduates of manufacturing engineering programs take coursework on topics specifically addressed to manufacturing processes, materials, or technology, they, as well as all other new manufacturing engineers, suffer from a lack of experience in the world of manufacturing. Areas that present challenges to the new manufacturing engineer include understanding modern manufacturing processes, knowing precisely what are the materials most suitable for production, being familiar with basic hardware and technology, and being adept at using computer programming languages.

Industry executives themselves recognize the limitations of academic training for the field of manufacturing engineering. In most cases, highly experienced manufacturing engineers must be recruited away from other companies. Companies are willing to hire newly

photo courtesy General Electric

photo courtesy General Electric

graduated engineers to work for them; however, some report having difficulty in doing so. Apparently, manufacturing engineering does not present a very glamorous image to engineering students who are unaware of new technological developments—such as CAD and CAM—that make manufacturing engineering an intriguing field.

According to the College Placement Council's survey of 1981-82 beginning salary offers, an average yearly salary offer of $24,833 was made to bachelor's degree holders with majors in industrial or mechanical engineering by automotive equipment, electrical machinery, and metal product manufacturers. The offers made to these new engineers ranged from $20,004 to $27,600 per year. Since most manufacturing engineers are employed in these industries, it is likely that beginning manufacturing engineers would receive similar offers.

Conclusion

Manufacturing engineering is a field that is constantly changing. It is definitely for the engineer who wants to be challenged. Energy costs, lagging productivity, and worldwide economic conditions have all increased demand for manufacturing engineers in industry as companies reindustrialize using the newest and most efficient technologies available. It is clear that the manufacturing world today is not what it was yesterday or 10 years ago, and chances are it will be even more different tomorrow and 10 years from now.

For a directory of colleges, universities, and technical institutes with programs in manufacturing engineering or manufacturing engineering technology, write to:

Society of Manufacturing Engineers
Education Department
1 SME Drive
P.O. Box 930
Dearborn, Michigan 48128.

College Programs in Manufacturing Engineering or Manufacturing Engineering Technology

More than 225 U.S. colleges and universities offer accredited baccalaureate degrees in engineering. Here's a list of the schools offering programs accredited by the Engineers' Council for Professional Development/Accrediting Board for Engineering and Technology (name change as of Jan. 1, 1980) that lead to B.S. degrees in manufacturing engineering or manufacturing engineering technology:

Arizona State University
Tempe, Ariz. 85281

Boston University
Boston, Mass. 02215

Bradley University
Peoria, Ill. 61625

Brigham Young University
Provo, Utah 84602

California Polytechnic State University
San Luis Obispo, Calif. 93407

Houston, University of—
College of Technology
Houston, Tex. 77004

Memphis State University
Memphis, Tenn. 38152

Murray State University
Murray, Ky. 42071

New Jersey Institute of Technology
Newark, N.J. 07102

Pittsburg State University
Pittsburg, Kans. 66762

Southern Colorado University
Pueblo, Colo. 81001

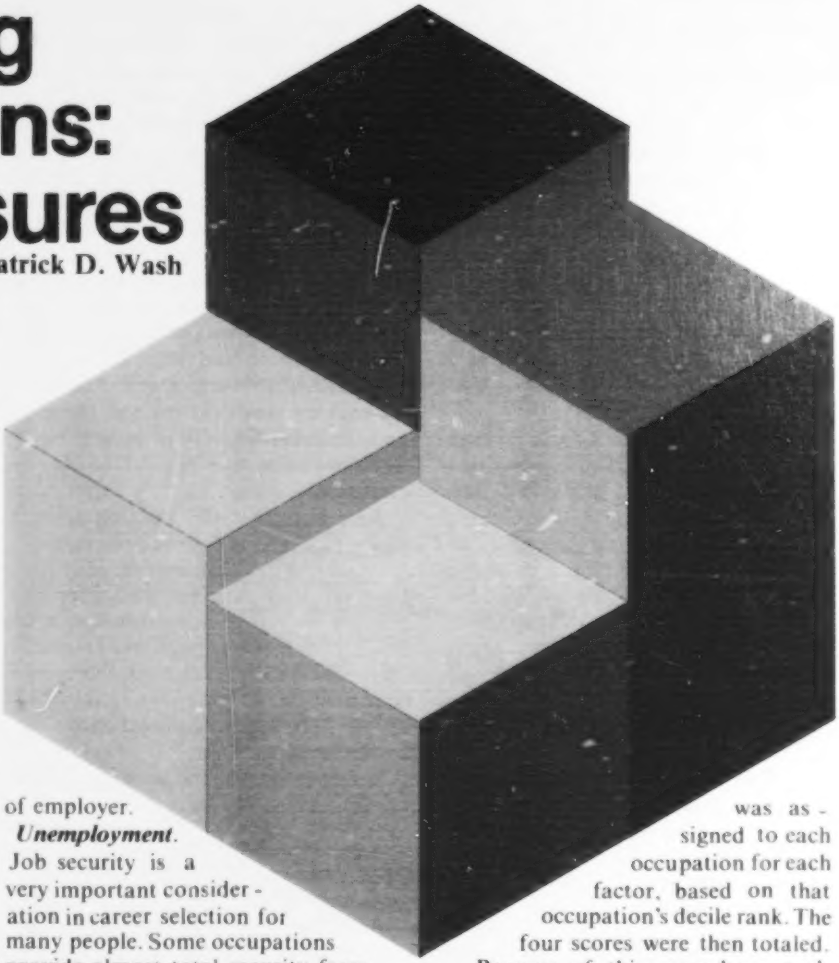
Utah State University
Logan, Utah 84322

Weber State College
Ogden, Utah 84408

Source: Education Department, Society of Manufacturing Engineers (SME).

Comparing Occupations: Four Measures

by Patrick D. Wash



What's the most attractive job? Many people—from youngsters formulating career plans to individuals contemplating reentry into the labor force or a midcareer change—would like to know. Of course, what constitutes an "attractive" or "good" occupation varies with the individual and depends on personal values. A factor such as ease of entry may be important to one person but low on another's list of priorities. In order to establish a framework within which occupations can be compared, this article details four occupational characteristics: Size, projected rate of growth, average earnings, and susceptibility to unemployment. This information is presented for 177 occupations—accounting for about half of total employment—based on how each occupation compares with all others on each of these four factors.

Size. The number of workers already in an occupation is an important indication of future opportunities because so many job openings result when workers transfer to other jobs or leave the labor force. The larger the occupation, therefore, the greater the number of openings.

Growth. The rate at which an occupation is growing is the second major determinant of openings. If an occupation grows rapidly, it will have more openings than if it grows slowly. Furthermore, the demand for talent in a growing occupation generally improves chances for advancement and mobility.

Earnings. The importance of this factor is obvious. One should keep in mind that the earnings estimates used in this study are national averages for all skill levels within an occupation. Regional differences exist, as well as differences based on experience and type and size of employer.

Unemployment. Job security is a very important consideration in career selection for many people. Some occupations provide almost total security from layoff while others are highly susceptible to recessionary pressures. Many of the skilled craft occupations, for example, have high rates of unemployment.

Making Comparisons

If the information is available, any occupation can be compared with any other. The table accompanying this article compares 177 occupations with each other. These occupations, which employ at least 25,000 workers each, were selected because reasonably good comparability exists between the sources of most of the data. Data for 1980 employment levels and 1980-90 growth rates are from the Industry-Occupation Matrix, which is based on the Occupational Employment Statistics Survey; data on unemployment rates and earnings are from the Current Population Survey.

To prepare the table, a score of 1 to 10 was assigned to each occupation for each factor, based on that occupation's decile rank. The four scores were then totaled.

Because of this procedure, each factor has the same weight in the total score; a large difference in employment, therefore, received proportionately the same weight as a small difference in growth rate.

The highest possible score was 40 and the lowest was 4; actual scores ranged from a high of 37 for physicians, systems analysts, electrical engineers, and lawyers to a low of 7 for ushers, lobby attendants, and ticket takers. Occupations are listed in the table in accordance with their total score. In addition to their score for each factor, the table also lists the level of education usually required for entry into the occupation.

How To View the Rankings

What does this ranking really mean? The relative position of an occupation on the list indicate how it compares with the other occupations in terms of the

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total score for the four factors combined. However, when looking over the table, it is best to keep some limitations of the data in mind.

For one thing, the ranking system utilizes national averages, and, therefore, can differ significantly from the experience of individual workers. For example, "carpenter" received a relatively low score in large part because of its traditionally high unemployment rates. The occupation is very sensitive to overall economic conditions and many carpenters experience frequent periods of layoff. But many other carpenters have steady employment.

In addition, there is no single job market for an occupation. For most occupations, there are many regional or area submarkets rather than a single national market. And for many occupations, there also are different markets by specialty, as well as by qualifications. For example, graduates of top law schools have very favorable prospects. A highly competitive job market for salaried positions faces the remaining law school graduates, however. Of course, lawyers can always open their own practice, but many find it difficult to earn a living in the beginning. Even the job market for physicians exhibits some imbalances. Some popular specialties are in oversupply while critical shortages of all kinds of physicians exist in many inner cities and in rural areas. Teaching is another occupation in which supply-demand conditions vary geographically or by specialty. Because of declining enrollment, the overall prospects for secondary school teachers are not too good. Because of recent migration patterns, however, demand is much stronger in the South and West than in the Northeast and North Central parts of the country. And in all regions, there are good opportunities for persons to teach math, science, and special education classes.

Also note that this ranking scheme treats each of the four factors equally. You may have a different set of values, however. High earnings may be less important to you than to someone else. Some people place much less emphasis on job security than do others. It is possible to construct your own rankings by giving more weight to those factors that are important to you.

Besides what is in the table, you might also wish to consider what is not. Many occupations were excluded from this rating system because they were small or because sufficient data were not available for analysis. And an important factor to take into account for the occupations that are listed—the level of competition for available jobs—was not incorporated into the ranking system. It cannot be quantified for most occupations. For occupations in which a supply-demand analysis can be prepared, information about the degree of competition that jobseekers in these fields are likely to face is presented in the Bureau's *Occupational Outlook Handbook*. Many job outlook statements in the *Handbook* also provide information about job competition based on a qualitative assessment that reflects insights about supply-demand conditions in occupations gained through research, including testimony from experts in various fields.

The following table can be a useful place to start learning about the occupations that interest you. Naturally, you will not make your final career plans until you have much more information about different occupations and about your own preferences and abilities.

Ranking of Occupations by Selected Characteristics

Occupation	1980 employment	Projected employment change, 1980-90	Usual weekly earnings[1], 1979-81 average	Unemployment rate, 1972-81 average	Required level of education, training, or work experience[2]
Physician	9	8	10	10	C
Lawyer	9	8	10	10	C
Systems analyst	7	10	10	10	C
Electrical engineer	8	9	10	10	C
Professional nurse	10	10	6	9	P,C
Computer programmer	7	10	9	9	C
Dentist	7	7	10	10	C
Aero-astronautic engineer	4	10	10	10	C
Mechanical engineer	7	8	10	9	C
Civil engineer	7	8	10	9	C
Data processing machine mechanic	4	10	9	10	P
Accountant	9	8	8	8	C
Real estate agent and broker	9	9	6	9	P
Industrial engineer	6	8	10	9	C
Securities sales agent and representative	4	8	10	9	C
Geologist	2	8	10	10	C
Chemical engineer	3	7	10	10	C
Veterinarian	2	9	9	10	C
Architect	4	9	9	8	C
Police patrolman and patrolwoman	8	4	8	10	P
Insurance agent and broker	8	6	7	9	P
Economist	1	10	10	8	C
Elementary school teacher	10	5	6	8	C

Note: All footnotes at the end of table.

Ranking of Occupations by Selected Characteristics

Occupation	1980 employment	Projected employment change, 1980-90	Usual weekly earnings[1], 1979-81 average	Unemployment rate, 1972-81 average	Required level of education, training, or work experience[2]
Firefighter	7	4	8	10	P
Construction inspector, public administration	3	8	8	10	P
Drafter	8	8	7	6	P
Blue-collar worker supervisor	10	3	8	7	P
Computer and peripheral equipment operator	7	10	4	7	P
Office machine and cash register servicer	3	10	7	8	P
Dental hygienist	4	10	6	8	P
Chemist	5	6	9	8	C
Pharmacist	6	2	10	10	C
Electrician	9	5	9	5	P
Optometrist	1	6	10	10	C
Real estate appraiser	2	9	6	10	P
Licensed practical nurse	9	9	3	6	P
Psychologist	4	8	9	9	C
Secondary school teacher	10	1	7	9	C
X-ray technician	5	9	5	8	P
Mechanical engineering technician	3	8	9	7	P
Purchasing agent and buyer	7	3	9	8	P,C
Radio and television repairer	4	9	7	7	P
Buyer, wholesale and retail	8	5	6	8	P,C
Diesel mechanic	7	7	7	6	P
College and university teacher	9	1	9	8	C
Plumber and pipefitter	8	6	9	4	P
Truckdriver	10	7	6	3	H
Auto mechanic	9	7	5	5	P
Claims adjuster	4	9	4	9	P
Medical technician	5	9	4	8	P
Medical laboratory technologist	5	9	5	7	P,C
Personnel and labor relations specialist	7	3	9	7	C
Writer and editor	6	7	7	6	P,C
Airplane pilot	4	3	10	8	P,C
Claims examiner	2	10	4	9	P
Photoengraver and lithographer	3	7	8	7	P
Aircraft mechanic	5	3	9	8	P
Air-conditioning, heating, and refrigeration mechanic	7	6	6	6	P
Designer	7	2	9	7	C
Underwriter	4	5	7	9	C
Secretary	10	8	2	5	H
Inspector, except construction, public administration	6	2	8	9	P,C
Brickmason	6	10	8	1	P
Physical therapist	2	10	5	7	C
Speech and hearing clinician	2	10	5	7	C
Police detective	4	2	8	10	P
Machinist	8	3	7	6	P
Retail sales manager	8	5	5	6	P
Social worker	8	6	5	5	C
Postal clerk	8	1	8	7	H
Tool-and-die maker	7	1	9	7	P
Manual arts, music, and recreation therapist	1	10	5	7	P,C
Air traffic controller	1	4	10	8	P,C
Nurse aide and orderly	10	10	1	2	H
Bookkeeper	10	4	3	6	H
Health record technologist	1	9	4	9	P
Surgical technician	1	10	4	8	P
Biological scientist	3	2	9	9	C
Preschool and kindergarten teacher	9	6	3	5	P,C
Reporter and correspondent	3	7	7	6	P,C
Millwright	5	5	9	4	P
Public relations specialist	5	5	8	5	C
Welder and flamecutter	9	6	6	2	H,P
Auto body repairer	7	7	5	4	H
Concrete and terrazzo worker	6	9	7	1	P
Dietitian	2	9	5	6	C
Child care worker	9	8	1	4	H
Guard and doorkeeper	9	7	3	3	H
Carpenter	10	5	6	1	P
Drywall applicator and taper	5	9	7	1	H
Dental laboratory technician	3	8	4	6	P
Vocational education teacher	1	7	6	7	C
Bus driver	8	2	5	6	H
Ceiling, tile, and floor layer	1	9	7	4	H
Flight attendant	3	3	8	7	P
Restaurant manager	9	3	4	5	P
Stock clerk	9	4	4	4	H
Dispatcher, vehicle service or work	5	5	6	5	H
Librarian	6	1	6	8	C
Payroll and timekeeping clerk	7	5	4	5	H
Adult education teacher	5	3	8	5	C
Dental assistant	6	10	1	4	H

Note: All footnotes at the end of table.

Comparing Occupations

Ranking of Occupations by Selected Characteristics

Occupation	1980 employment	Projected employment change, 1980-90	Usual weekly earnings[1], 1979-81 average	Unemployment rate, 1972-81 average	Required level of education, training, or work experience[2]
Sheet-metal worker	7	3	8	3	P
Janitor and sexton	10	5	2	3	H
Barber	6	1	3	10	P
Delivery and route driver	9	2	5	4	H
Typist	10	5	2	3	H
Engineering equipment mechanic	5	2	7	6	P
Photographer	5	3	6	6	P
Radio and televison announcer	3	8	5	4	P
Cabinetmaker	4	8	4	4	P
Receptionist	8	7	2	3	H
Assessor	1	4	5	9	P
Cosmetologist	9	2	1	7	P
Statistician	1	4	8	6	C
Assembler	10	5	3	1	H
Cook, except private household	10	6	1	2	P
Housekeeper, hotel and motel	3	9	2	5	H
Bill collector	5	6	3	5	H
Industrial engineering technician	1	7	7	4	P
Glazier	2	7	6	4	P
Shipping and receiving clerk	8	3	4	4	H
Ticket agent	3	1	8	7	H
Bookkeeping, billing machine operator	7	6	2	4	H
Butcher and meatcutter	7	2	6	4	P
Crane, derrick, and hoist operator	6	2	8	3	P
Structural steel worker	4	4	10	1	P
Sales clerk	10	4	1	3	P
Waiter and waitress	10	6	1	1	H
Stock handler	10	4	2	2	H
Teacher aide, except monitor	9	5	1	3	H
Industrial truck operator	8	3	5	2	H
Musician, instrumental	6	3	6	3	H,P
Asbestos and insulation worker	3	8	6	1	H
Carpet cutter and layer	3	7	4	3	H
Welfare service aide	5	9	1	2	H,P
Oiler	2	5	8	2	P
Bartender	8	5	2	2	H
Vehicle cleaner	6	8	2	1	H
Farm equipment mechanic	1	6	3	6	P

Occupation	1980 employment	Projected employment change, 1980-90	Usual weekly earnings[1], 1979-81 average	Unemployment rate, 1972-81 average	Required level of education, training, or work experience[2]
Statistical clerk	5	2	3	8	H
Tailor	4	6	3	3	P
File clerk	8	6	1	1	H
Construction laborer	5	6	4	1	H
Heat treater, annealer, and temperer	1	4	7	3	H
Animal caretaker	5	5	1	4	H
Elevator operator	3	6	3	3	H
Boilermaker	2	2	9	2	P
Keypunch operator	8	1	2	4	H
Painter	8	2	4	1	H
Baker	4	2	3	5	P
Library assistant	6	1	2	5	H
Gardener and groundskeeper	9	2	2	1	H
Garbage collector	6	4	3	2	H
Weigher	2	5	3	2	H
Group recreation worker	6	4	1	1	H,P,C
Roofer	6	3	4	1	H
Crossing guard and bridge tender	1	2	3	7	H
Jeweler and silversmith	1	3	4	8	P
Merchandise displayer	1	5	2	5	H,P
Sewer and stitcher	10	1	1	1	H
Sawyer	4	5	2	2	H
Taxi driver and chauffeur	6	1	3	3	H
Furniture upholsterer	2	1	4	5	P
Parking attendant	2	7	1	2	H
Mixing operative	3	1	5	3	H
Recreation facility attendant	4	6	1	1	H
Forester and conservationist	1	1	6	3	P,C
Metal molder	2	2	6	2	H
Photographic process worker	4	1	3	3	H
Messenger	3	4	2	2	H
Dressmaker, except factory	3	1	1	5	H
School monitor	2	1	1	6	H
Sailor and deckhand	1	1	7	1	H
Duplicating machine operator	1	2	2	4	H
Weaver	2	1	2	2	H
Usher, lobby attendant	2	2	1	2	H

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[1] Earnings of wage and salary workers who usually work full time.

[2] H=Jobs for persons who have no work experience beyond high school;
P=Jobs that require varying amounts of work experience or specialized postsecondary training, including apprenticeship;
C=Jobs that usually require 4 or more years of college.

Grab Bag

What They Want in an Employer

Many people have had so much trouble finding jobs recently that it's hard to remember that people still pick their employers as well as being picked by them. Thomas Readon surveyed several hundred students in two groups, those with an above-average grade point average and those with average grades, to learn what they sought in an employer. The 10 most attractive employer characteristics were the same for both groups, but the order of preference differed. Here's how they were ranked by the above average group, with the rank of the characteristic by the average group in parentheses:

- Employer in a growth industry (8)
- potential for advancement (3)
- past history of growth/success (9)
- opportunity for continued education (10)
- salary (4)
- national or local reputation (1)
- location of employer (2)
- fringe benefits (6)
- responsibility/challenge/freedom (5)
- prestige of working for employer (7)

Other highlights of the research include the following:

- The possibility of relocation is becoming a most crucial factor for all students. It seems that those who really want the job are willing to accept the fact that mobility and better job prospects are synonymous. Not surprising, however, is that students who lived near the employing agency rated the location of the employer as very influential. It appears that these students would prefer to locate in their own backyard, rather than seek employment elsewhere.

- The opportunity for continuing one's education with the employer is also gaining appeal, particularly for those graduates who recognize that advancement, with all other things being equal, comes with further training.

- A friend's past contacts with the recruiter were a most influential factor, assuming that the recruiter was well received by the friend.

Readon reports on his study in the Journal of College Placement, Winter 1980 issue.

People's Degree of Association Increases

Over the years between 1970/71 and 1979/80, the number of bachelor's degrees awarded by the Nation's colleges and universities increased, but not nearly as much as did the number of associate and first-professional degrees such as law and medicine. The National Center for Education Statistics has reported that the number of bachelor's degrees awarded went up from 848,418 to 941,744 in the period, an increase of 11 pecent. But associate degrees awarded rose from 253,635 to 405,378 (peaking at 416,947 in 1977/78), an increase of 59.8 percent. First professional degrees went up 89 percent, from 38,294 to 70,461.

Among those receiving associate degrees, the popularity of different curriculums shifted a great deal over the period. Arts and sciences, which had accounted for 57.4 percent of all awards, accounted for only 37.5 percent in 1979/80. In contrast, all the occupational divisions showed substantial increases, ranging from 77.8 percent for mechanical/engineering technologies to 184.2 percent for health services/paramedical technologies.

Women received a majority of the associate degrees awarded in most curriculums in 1979/80 and a majority of the total. Only in mechanical/engineering technologies was the percentage of women receiving degrees relatively small (8.1), and even in this case the number of women had increased greatly over the 10 year period.

Long Life for the Long Hairs

The long and productive careers of many famous conductors, such as Arturo Toscanini and Arthur Fiedler, makes one wonder if symphony conductors really are a remarkably long-lived group. The findings of a recent study made by the Metropolitan Life Insurance Company bear out such a belief.

This conclusion is based on a study of 437 active and former male conductors of major regional and community symphony and opera orchestras in the United States. It turned out that the mortality among the conductors was 32 percent below that of the general male population in the same age group. While relative mortality was low for each age group, it is particularly striking that the lowest relative mortality—56 percent below the general rate—was recorded at ages 50-59, the years of life generally believed to be most affected by the stresses of increasing professional responsibilities.

These findings contrast sharply with the results of the few studies dealing with all types of musicians. Those studies found that musicians as a group have a much higher mortality rate than does the general population. The report concludes, "The exceptional longevity enjoyed by symphony conductors lends further support to the theory that work fulfillment and world-wide recognition of professional accomplishments are important determinants of health and longevity."

Grab Bag

Women at Work

We hear a lot about the dramatic increase in the participation of women in the labor force. Women also hold a larger share of the jobs in many occupations than they did 30 years ago. The following table shows how their numbers have increased in a few occupations:

Occupation	*Number in thousands*		*Women as percent of all workers in occupation*	
	1950	1979	1950	1979
Accountant	56	180	14.9	32.9
Bank official and and finiancial manager	13	55	11.7	31.9
Bank teller	28	216	45.2	92.9
Buyer and purchasing agent	6	136	9.4	30.2
Lawyer and judge	7	62	4.1	12.4
Physician and osteopath	12	46	6.5	10.7
Secretary and typists	1,494	1,917	96.7	98.6
Teacher, college and university	28	139	22.8	31.6

Chemical Reaction

Economic theory has it that once people learn that too many workers are around for the number of jobs in an occupation, fewer people will plan to enter that occupation. Such a reaction seems to be taking place in the job market for teachers, which has had a well-publicized surplus of job candidates. But shortages in some specialties are now reported. For example, a 1981 national survey of State science supervisors found that chemistry teachers were badly needed in some States. Nine of the 47 States responding to the survey characterized the chemistry teacher supply in their States as a critical shortage. Twenty one said they had a shortage, while four indicated a slight shortage. Eight States reported an adequate supply, and five had at least a slight surplus.

The Hot and the Not

It is no secret that many occupations are growing rapidly in size while others are declining (seen any ice men lately?). The degree of the growth of the hot occupations is outlined in a recent article in the Monthly Labor Review,"Occupational Winners and Losers: Who They Were During 1972-80," by Carol Boyd Leon. Leon found that most of 200 or so occupations that employ 50,000 workers or more grew between 1972 and 1980. The bulk of the growth, however, occurred in just 20 occupations that added 200,000 or more workers during the period. The following is a list of the occupations with the largest absolute increase in employment between 1972 and 1980:

Occupation	*Employment increase*	
	Number	*Percent*
Secretary	927,000	31.4
Cashier	556,000	55.7
Registered nurse	501,000	62.5
Cook	465,000	53.7
Truckdriver	403,00	28.0
Accountant	333,000	46.5
Engineer	331,000	30.0
Computer and peripheral machine operator	326,000	166.3
Bookkeeper	320,000	20.2
Computer specialist	311,000	113.9
Waiter	292,000	26.0
Engineering and technician	267,000	32.2
Building interior cleaner excluding janitor and sexton	264,000	39.5
Health technologist	256,000	81.3
Heavy equipment mechanic	249,000	34.9
Bank teller	243,000	84.4
Real estate agent and broker	233,000	66.8
Lawyer	219,000	72.3
Sales representative, wholesale	219,000	31.5
Stockhandler	218,000	30.2

The following is a list of occupations that declined by at least 60,000:

Occupation	*Employment decrease*	
	Number	*Percent*
Deliver and route worker	-308,000	-34.5
Cleaner and servant	-222,000	-31.1
Farm owner and tenant farmer	-211,000	-31.1
Farm laborer, unpaid family workers	-171,000	-37.6
Garage worker and gas station attendant	-165,000	-32.9
Sewer and stitcher	-148,000	-15.8
Child-care worker	-112,000	-20.6
Textile operative	-101,000	-23.8
Telephone operator	-76,000	-19.4
Stenographer	-61,000	-48.8

College Job Market in the Doldrums?

According to the College Placement Council, job offers to college graduates dropped sharply this year. The number of job offers has been climbing for 6 years, reaching 62,835 in 1981; but this year it fell to 51,290.

The Council telephoned many placement offices to learn why but ended up with a mixed picture. Some employers postponed hiring decisions and others cut back on recruiting trips, partly to save money and partly because their needs were filled quickly as students accepted offers earlier in the year than is customary.

It's On The Way

An updated report presenting data underlying the job outlook information contained in the 1982-83 *Occupational Outlook Handbook* will be available late this year. Included will be statistics on the number of people completing training programs in various fields and, for the first time, an indepth look at the movement of workers into, out of, and between occupations. Watch for this new comprehensive report.

"Occupational Projections&Training Data 1982 Edition"

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Manufacturing Engineering
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ORIGINAL

Matching Yourself
With the
World of Work

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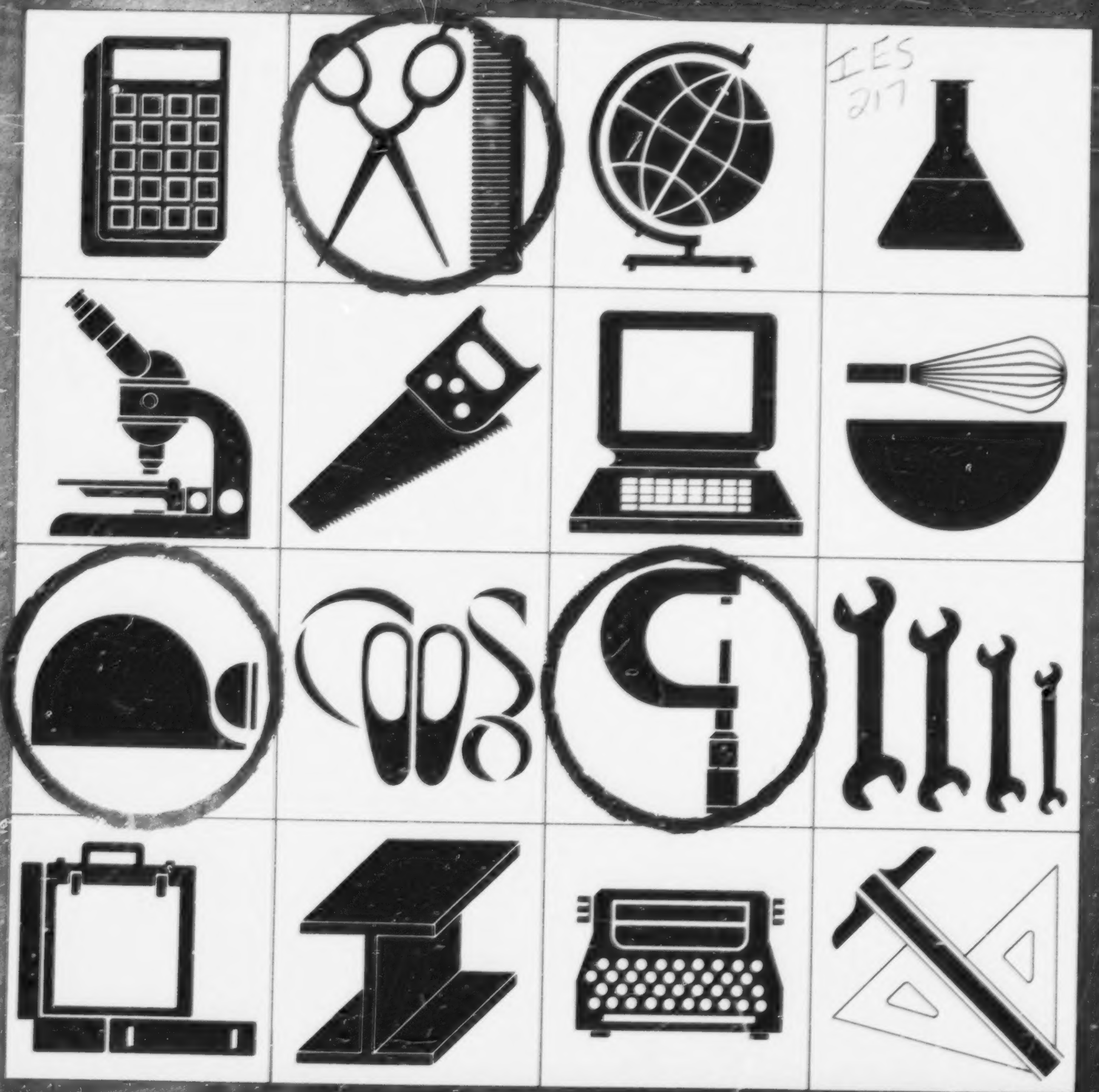

U.S. Department of Labor
Raymond J. Donovan, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner

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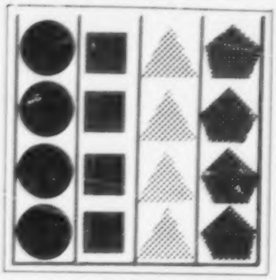
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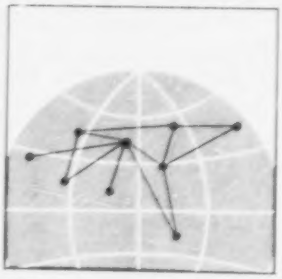
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OCCUPATIONAL OUTLOOK QUARTERLY
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Melvin C. Fountain, *editor*
Neale Baxter, *managing editor*
Gail M. Martin, *staff writer*
Richard Mathews, *art director*

Matching Yourself With the World of Work — Gail M. Martin and Melvin C. Fountain — 2

Jobs differ widely in the ability, educational level, and other attributes they require of workers. This table lists 16 characteristics of jobs—such as education required and salary level—and shows the characteristic's relation to more than 250 individual occupations. Students can use this table to compare their interests with the characteristics of an occupation.

The Joy of Classifying:
A Counselor's Guide to Taxonomies and Crosswalks — Neale Baxter — 13

Many different systems have been developed for classifying occupations. A few of the major systems are described here, along with an idea of the kind of information collected and published by the agency using the system.

Occupational Earnings From Top to Bottom — Peter Ward

New data make it possible to compare salaries for 247 occupations. Although comparing pay is a tricky business, this ranking will serve as a rough guide to the salaries in many of the largest occupations.

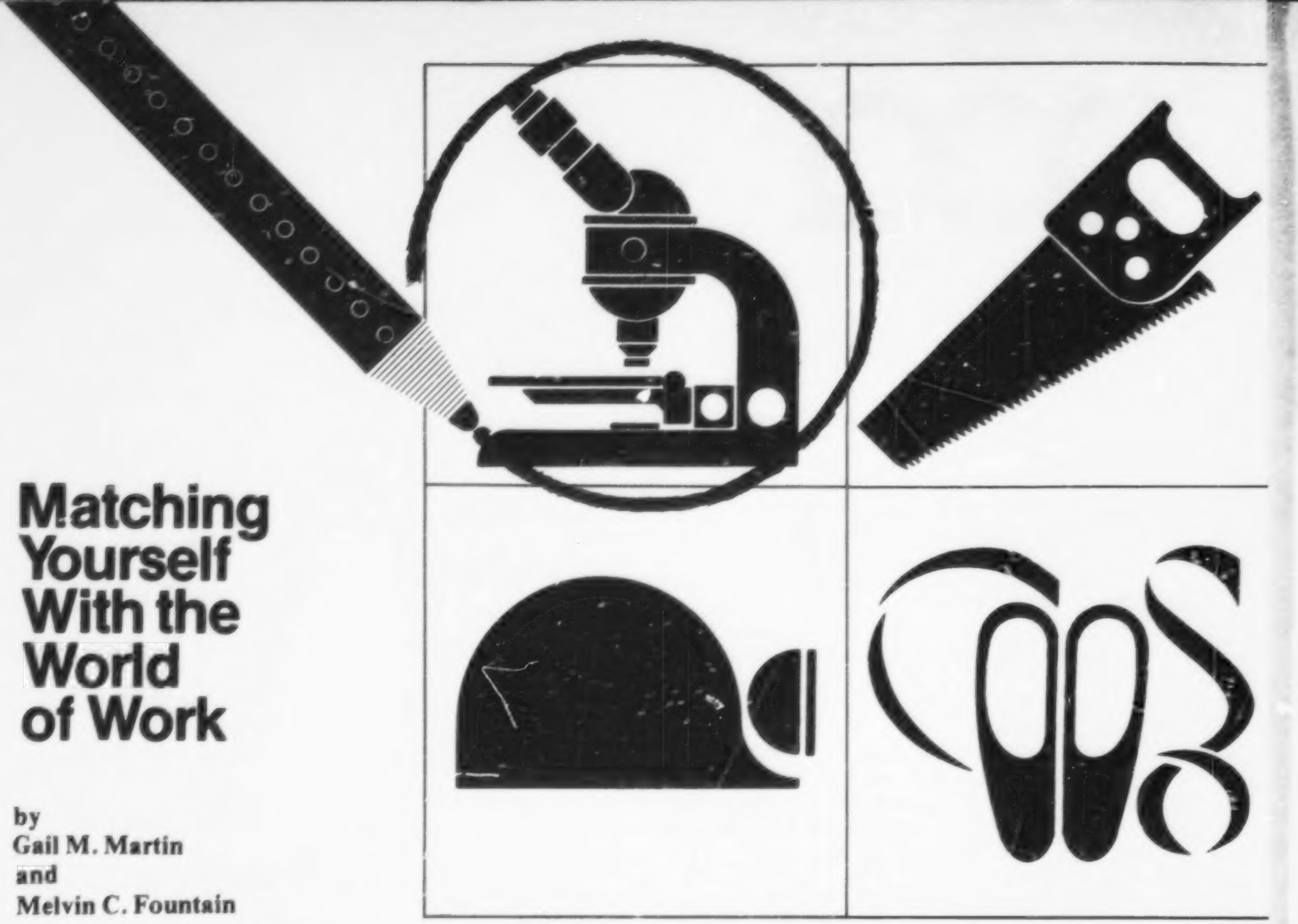
For Librarians Who Feel Lost in the Stacks — Ellen Brown — 26

Librarians who are thinking about changing careers will find some advice on what to do in this article. And much of the information is applicable to career changers in general.

You're a What? Travel Manager — Gail M. Martin — 28

Hannibal could have used one when he traveled across the Alps with all those elephants.

Counseling Aids 31



Matching Yourself With the World of Work

by
Gail M. Martin
and
Melvin C. Fountain

In choosing an occupation, it is helpful to know as much as possible about what it demands. Whether you are trying to decide on an occupation now or you are preparing to enter it in the future, knowing what education or skills are required and something about the work environment of the job will help you make an informed choice. For example, knowing whether there are part-time opportunities in an occupation or knowing that a job does—or does not—require working with people or physical stamina can be important. And, the degree of employment growth or competition in a field may affect whether you get a job in it or how fast you advance.

The following guide was designed to help you compare these types of job characteristics with your interests and skills. Listed and defined are 17 occupational characteristics and requirements which are matched in the chart that follows with more than 250 occupations chosen from the 1982-83 *Occupational Outlook Handbook.*

One note of caution: The chart can be helpful in organizing occupational information, but it is intended only as a general exploratory tool. Before you eliminate an occupation from consideration because of a single characteristic, you should realize that the job characteristics presented in the table refer only to a typical job in the occupation. All jobs in an occupation are not alike. Most accountants, for example, work alone, but accountants who are auditors or investigators may work with others. Therefore, if you have an interest in an occupation, you should not disregard that career simply because one or two of its characteristics do not appeal to you. You should check further into the occupation—either through reading or by talking to your counselor to find out if some jobs in the occupation or occupational cluster better match up with your personality, interests, and abilities.

Following is a list—together with definitions—of the characteristics shown in the chart. Key words are sometimes listed to give an idea of the kinds of skills included.

Job Requirements

(1) Leadership/persuasion—must be able to stimulate others to think or act in a certain way. Automobile sales workers who influence customers to buy and blue-collar worker supervisors are examples of occupations in which one must motivate others. Skills include organizing people and groups, supervising, directing, taking initiative, preaching, selling, promoting, counseling, speechmaking, negotiating, and mediating.

(2) Helping/instructs others—helps others to learn how to do or understand something. Skills include treating, teaching, listening, and counseling.

(3) Problem-solving/creativity—the development of new ideas, programs, designs, or products. Commercial artists who prepare the artwork in magazines and engineers who design machinery are examples of occupations

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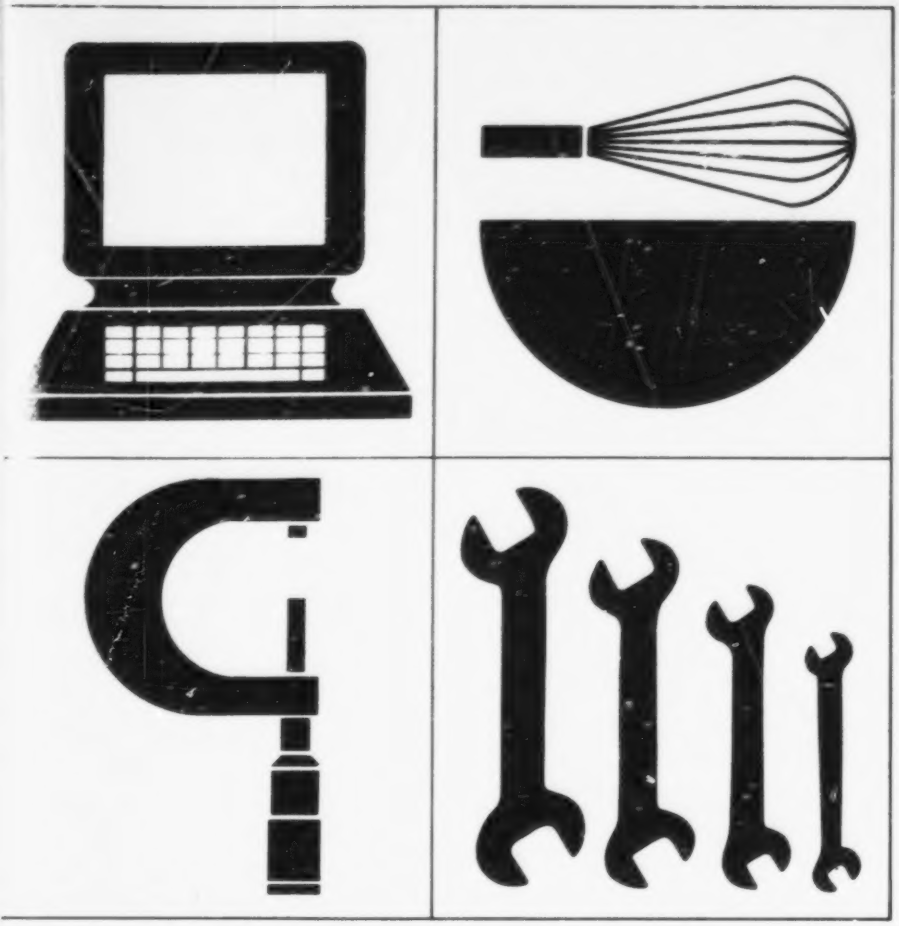
Gail M. Martin is an OOQ staffwriter.
Melvin C. Fountain is the editor of the OOQ.



that require creativity. Skills include designing, inventing, drawing, writing, and/or developing ideas programs.

(4) Initiative—ability to determine what needs to be done and motivation to complete the job without close supervision. A department store buyer, for example, must use initiative in anticipating customers' preferences, buying merchandise at the right price, and seeing that goods are in store when needed.

(5) Work as part of a team—essential interaction with fellow employees to get the work done. A school administrator, for example, works cooperatively with school principals, school committee members, and government officials.

(6) Frequent public contact—ability to meet or deal with the public on a regular basis. Librarians must meet and deal easily with the public, for example.

(7) Manual dexterity—adept with hands to make, build, fix, and do things. Skills include operating tools, growing plants, testing, drafting, carrying, instructing sports activities, and moving rhythmically.

(8) Physical stamina—ability to endure stress and strain on the job, including heavy lifting, standing, or being uncomfortably confined for long periods.

Work Environment

(9) Hazardous—conditions that could present danger because of use of dangerous or infectious materials or working in dangerous surroundings where accidents are common. Most of these jobs are not inherently dangerous, but they do require adherence to safety precautions. Medical laboratory workers, for example, must use precautions when handling infectious material.

(10) Outdoors—work in which a major portion of time is spent outdoors, usually without regard to weather conditions.

(11) Generally confined—work which requires staying in a specific place for most of the workday.

Occupational Characteristics

(12) Jobs concentrated geographically—jobs located in or around one or a few geographic areas.

(13) Part-time—many workers are employed for less than 35 hours a week.

(14) Earnings—Estimated average earnings for 1980 were compiled for each occupation, and the earnings were ranked and divided into three levels:

○ lowest level
○ middle level
● highest level

Keep in mind that earnings within an occupation vary widely, and some workers earn more or less than the average level shown.

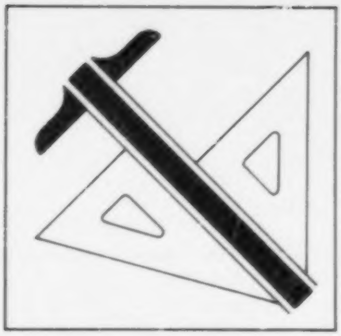
(15) Employment growth—New job openings come about through employment growth and replacement needs. Job opportunities in a particular occupation usually are favorable if employment is expected to increase at least as rapidly as for the economy as a whole. But don't pick a job based solely on growth. Because of replacement needs, slow growing occupations may actually have more job opportunities than their growth rates indicate. Projected 1980-90 growth rates for each occupation were compiled, and the rates were ranked and divided into three levels:

○ lowest level
○ middle level
● highest level

(16) Entry requirements—Education and training requirements for each job were compiled and broken down into three levels:

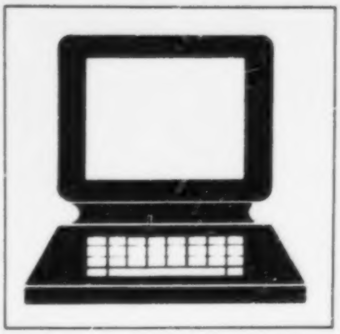
○ entry-level-high school or less education is sufficient, and the basics of the job can usually be learned in a few months of on-the-job training;
○ post high school training, such as apprenticeship or junior college, or many months of or years of experience are required to be fully qualified;
● 4 or more years of college usually required.

World of Work



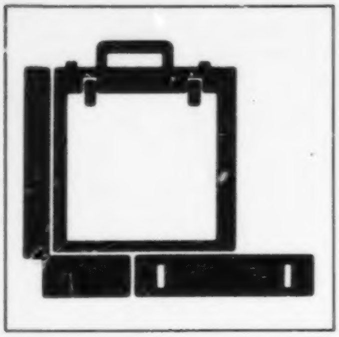
	Job requirements									Work environment				Occupational characteristics		
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Administrative and Managerial Occupations																
Accountants and auditors		●	●		●	●					●			○	○	●
Bank officers and managers	●	●	●	●	●	●					●			●	○	●
Buyers	●		●	●	●									○	○	●
City managers	●	●	●	●	●	●								●	○	●
College student personnel workers	●	●	●	●	●	●								1	1	●
Construction inspectors (government)		●	●	●	●		●			●				○	●	○
Credit managers	●	●	●		●	●					●			○	○	●
Health services administrators	●		●	●	●	●								●	●	●
Health and regulatory inspectors (government)		●	●	●	●		●			●				1	○	○
Hotel managers and assistants	●	●	●	●	●	●								1	●	○
Medical record administrators	●		●	●	●									●	●	●
Occupational safety and health workers		●	●	●	●		●			●				●	1	●
Personnel and labor relations specialists	●	●	●	●	●	●								○	○	●
Purchasing agents	●		●		●									1	○	●
School administrators	●	●	●	●	●	●								●	○	●
Underwriters			●											1	○	●
Engineers, Surveyors, and Architects																
Architects			●	●	●	●	●							●	●	●
Landscape architects			●	●		●	●							1	●	●
Surveyors and surveying technicians					●		●	●		●				○	○	○
Engineers																
Aerospace engineers			●	●	●									●	●	●
Agricultural engineers			●	●	●									●	●	●
Biomedical engineers			●	●	●									●	●	●
Ceramic engineers			●	●	●									●	●	●
Chemical engineers			●	●	●									●	○	●
Civil engineers			●	●	●									●	●	●
Electrical engineers			●	●	●									●	●	●
Industrial engineers			●	●	●									●	●	●
Mechanical engineers			●	●	●									●	●	●
Metallurgical engineers			●	●	●									●	●	●
Mining engineers			●	●	●									●	●	●
Petroleum engineers			●	●	●							●		●	●	●

Notes appear at end of table.



	Job requirements									Work environment			Occupational characteristics			
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Natural Scientists and Mathematicians																
Mathematical scientists and systems analysts																
Actuaries			●	●							●			●	●	●
Mathematicians			●	●										●	○	●
Statisticians			●	●										○	○	●
Systems analysts		●	●	●	●						●			●	●	●
Physicial scientists																
Astronomers			●	●										●	○	●
Chemirts			●	●										●	○	●
Geographers			●	●	●									●	○	●
Geologists			●	●	●					●				●	●	●
Geophysicists			●	●	●					●				●	●	●
Meteorologists			●	●	●									●	○	●
Oceanographers			●	●	●					●		●		●	○	●
Physicists			●	●										●	○	●
Life scientists																
Agricultural and biological scientists			●	●										1	○	●
Biochemists			●	●										●	○	●
Food technologists			●	●										●	○	●
Foresters			●	●	●			●	●	●				○	○	●
Range managers			●	●	●			●	●	●				1	○	●
Soil conservationists		●	●	●						●				●	○	●
Social Scientists, Social Workers, Religious Workers, and Lawyers																
Lawyers	●	●	●	●	●	●								●	○	●
Social scientists and urban planners																
Anthropologists			●	●	●									●	○	●
Economists			●	●										●	●	●
Historians			●	●										●	○	●
Market research analysts	●		●	●	●									●	1	●
Project scientists			●	●	●	●								●	○	●
Psychologists		●	●	●		●								●	○	●
Sociologists			●	●		●								●	○	●
Urban and regional planners	●		●	●	●	●								●	●	●

World of Work



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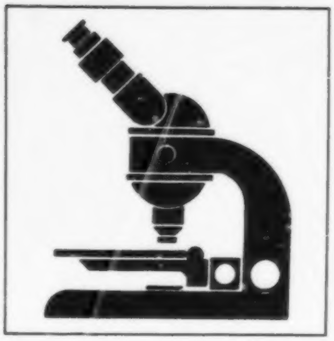
Social and recreation workers																
Recreation workers	●	●	●	●	●	●	●	●		●			●	○	○	○
Social workers	●	●	●	●	●	●								○	○	●
Religious workers																
Protestant ministers	●	●	●	●	●	●								○	ı	●
Rabbis	●	●	●	●	●	●								●	ı	●
Roman Catholic priests	●	●	●	●	●	●								○	ı	●
Teachers, Librarians, and Counselors																
College career planning and placement counselors	●	●	●	●	●	●								○	ı	●
College and university faculty	●	●	●	●	●	●							●	●		●
Cooperative extension service workers	●	●	●	●	●	●								○	ı	●
Employment counselors	●	●	●	●	●	●					●			ı	ı	●
Kindergarten and elementary school teachers	●	●	●	●	●	●	●	●					●	○	○	●
Librarians	●	●	●	●	●	●							●	○	○	●
Rehabilitation counselors	●	●	●	●	●	●	●							ı	ı	●
School counselors	●	●	●	●	●	●								○	○	●
Secondary school teachers	●	●	●	●	●	●								○	○	●
Health Diagnosing and Treating Practitioners																
Chiropractors	●	●	●	●	●	●	●	●					●	●	○	●
Dentists	●	●	●	●	●	●	●	●						●	○	●
Optometrists	●	●	●	●	●	●	●	●					●	●	○	●
Osteopathic physicians	●	●	●	●	●	●	●	●	●					●	●	●
Physicians	●	●	●	●	●	●	●	●	●					●	●	●
Podiatrists	●	●	●	●	●	●	●	●						●	●	●
Veterinarians	●	●	●	●	●	●	●	●	●					●	●	●
Registered Nurses, Pharmacists, Dietitians, Therapists, and Physician Assistants																
Dieticians	●	●	●	●	●	●							●	○	●	●
Occupational therapists	●	●	●	●	●	●	●	●						ı	●	●
Pharmacists	●	●	●	●	●	●					●		●	●	○	●
Physical therapists	●	●	●	●	●	●	●	●						○	●	●
Physician assistants	●	●	●	●	●	●	●	●						○	ı	●
Registered nurses	●	●	●	●	●	●	●	●					●	○	●	○



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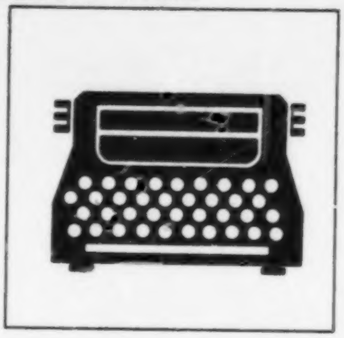
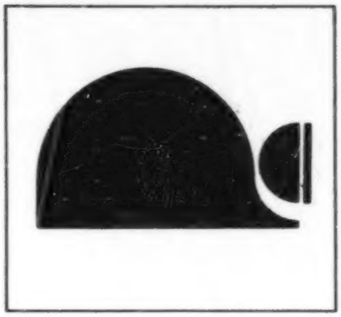
Respiratory therapy workers		●			●	●	●							○	●	○
Speech pathologists and audiologists	●	●	●	●	●	●	●							○	●	●
Health Technologists and Technicians																
Dental hygienists		●			●	●	●	●			●		●	○	●	○
Electrocardiograph technicians		●			●	●	●						●	[1]	●	○
Electroencephalographic technologists and technicians		●			●	●	●							[1]	●	○
Emergency medical technicians		●	●		●	●	●	●	●	●				○	○	○
Licensed practical nurses		●			●	●	●	●					●	○	●	○
Medical laboratory workers					●		●		●		●			○	●	[2]
Medical record technicians and clerks					●						●			○	●	[2]
Radiologic (X-ray) technicians		●				●	●		●				●	○	●	○
Surgical technicians		●			●	●	●							○	●	○
Writers, Artists, and Entertainers																
Communications occupations																
Public relations	●		●	●	●	●								○	○	●
Radio and television announcers and newscasters	●	●		●	●	●					●			○	●	●
Reporters and correspondents	●		●	●	●	●								[1]	○	●
Writers and editors	●		●	●	●						●		●	[1]	○	●
Design occupations																
Commercial and graphic artists and designers			●	●	●		●						●	[1]	○	○
Display workers	●		●	●			●		●					○	○	○
Floral designers			●			●	●				●			[1]	○	○
Industrial designers			●	●	●		●							[1]	○	●
Interior designers			●	●	●	●	●							[1]	○	○
Photographers			●	●		●	●						●	○	○	○
Performing artists																
Actors and actresses			●	●	●	●	●	●				●	●	○	○	○
Dancers			●	●	●	●	●	●				●	●	○	○	○
Musicians			●	●	●	●	●	●				●	●	○	○	○
Singers			●	●	●	●	●	●				●	●	[1]	○	○
Technologists and Technicians, Except Health																
Air-traffic controllers		●	●	●	●		●				●			●	○	●
Broadcast technicians			●		●		●				●			○	○	○
Drafters					●		●				●			○	●	○

World of Work



	Job requirements								Work environment					Occupational characteristics		
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Engineering and science technicians			●		●		●		2	2	2			◯	◯	◯
Legal assistants				2	●	2								◯	●	○
Library technicians and assistants		●			●	●	●						●	○	○	○
Programmers			●		●						●			◯	●	●
Technical writers			●	●	●						●			1	●	◯
Marketing and Sales Occupations																
Advertising workers	●		●	●	●									1	1	●
Automobile parts counter workers		●				●		●						○	◯	◯
Automobile salesworkers	●			●		●								◯	●	○
Cashiers						●	●				●		●	○	●	○
Insurance agents and brokers	●	●	●	●		●							●	◯	◯	◯
Manufacturers' salesworkers	●	●	●	●									●	●	○	●
Models					●	●		●				●	●	1	1	○
Real estate agents and brokers	●	●	●	●		●				●			●	◯	●	◯
Retail trade salesworkers	●					●		●					●	○	◯	○
Securities salesworkers	●	●	●	●		●							●	●	●	●
Travel agents	●	●	●	●		●								1	●	◯
Wholesale trade salesworkers	●	●	●	●		●								◯	◯	◯
Administrative Support Occupations, Including Clerical																
Airline reservation and ticket agents		●	●		●	●					●			◯	○	○
Bank clerks					●						●		●	○	●	○
Bank tellers					●	●					●		●	○	◯	○
Bookkeepers and accounting clerks					●						●		●	○	○	○
Claim representatives		●	●	●	●	●								○	●	◯
Collection workers	●			●	●	●					●			○	◯	○
Computer operating personnel			●		●		●				●			○	◯	◯
Hotel front office clerks		●	●		●	●					●			○	○	○
Mail carriers						●	●	●		●				◯	○	○
Postal clerks					●	●	●	●			●	●		◯	○	○
Receptionists		●			●	●					●		●	○	◯	○
Secretaries and stenographers				●	●	●	●							○	●	○
Teacher aides	●	●			●	●	●	●					●	○	◯	○
Telephone operators		●				●					●			○	○	○
Typists							●				●		●	○	◯	○

	Job requirements									Work environment			Occupational characteristics			
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Service Occupations																
Protective service occupations																
Correction officers	●	●			●			●	●		●			ı	●	○
FBI special agents	●	●	●	●	●	●	●	●	●	●				●	ı	●
Firefighters		●	●		●	●	●	●	●	●			●	○	○	○
Guards						●	●	●	●		●		●	○	○	○
Police officers	●	●	●	●	●	●	●	●	●	●				○	○	○
State police officers	●	●	●	●	●	●	●	●	●	●				○	○	○
Food and beverage preparation and service occupations																
Bartenders				●		●	●	●			●		●	○	○	○
Cooks and chefs				●			●	●			●		●	○	○	○
Food and counterworkers				●		●	●	●			●		●	○	●	○
Meatcutters						●	●	●	●		●			○	○	○
Waiters and waitresses				●		●	●	●					●	○	○	○
Waiters' assistants and kitchen helpers				●		●	●	●					●	○	●	○
Health service occupations																
Dental assistants					●	●	●	●						○	●	○
Medical assistants					●	●	●							○	●	○
Occupational therapy assistants		●			●	●	●	●					●	ı	●	○
Optometric assistants					●	●	●							ı	●	○
Physical therapy assistants		●			●	●	●	●						ı	●	○
Cleaning and building service occupations																
Hotel housekeepers and assistants						●	●	●						○	○	○
Personal service occupations																
Barbers						●	●	●			●		●	○	○	○
Bellhops and bell captains					●	●	●	●					●	○	○	○
Cosmetologists					●	●	●	●			●		●	○	○	○
Flight attendants		●			●	●	●	●						○	○	○
Agricultural and Forestry Occupations																
Forestry technicians							●		●					ı	●	○
Mechanics and Repairers																
Vehicle and mobile equipment mechanics and repairers																
Aircraft mechanics			●		●		●	●	●	●				●	○	○



	Job requirements									Work environment			Occupational characteristics			
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Automobile body repairers			●				●	●	●		●			◯	◯	◯
Automobile mechanics			●			●	●	●	●		●			○	◯	◯
Farm equipment mechanics			●											○	◯	◯
Truck mechanics and bus mechanics			●				●	●	●		●			◯	◯	◯
Electrical and electronic equipment repairers																
Appliance repairers			●	●		●	●							○	◯	◯
Central office craft occupations			●		●		●	●	●					I	○	○
Central office equipment installers			●		●		●	●	●					I	○	○
Computer service technicians			●	●		●	●							◯	●	◯
Electric sign repairers			●			●	●	●	●	●				I	I	◯
Line installers and cable splicers			●		●		●	●	●	●				◯	○	○
Maintenance electricians			●	●		●	●	●	●					◯	◯	◯
Telephone and PBX installers and repairers			●		●	●	●	●	●					◯	○	○
Television and radio service technicians			●	●		●	●		●				●	◯	●	◯
Other mechanics and repairers																
Air-conditioning, refrigeration, and heating mechanics			●				●		●					◯	◯	◯
Business machine repairers			●	●	●		●							◯	●	◯
Elevator constructors			●				●	●						●	◯	◯
Industrial machinery repairers			●				●	●	●					◯	◯	◯
Millwrights			●				●		●					●	◯	◯
Piano and organ tuners and repairers							●							○	○	◯
Pinsetter mechanics							●							I	○	◯
Vending machine repairers			●	●			●							I	○	◯
Watch repairers			●	●	●		●				●		●	○	○	◯
Construction and Extractive Occupations																
Construction occupations																
Bricklayers and stonemasons			●				●	●	●	●				◯	●	◯
Carpenters			●				●	●	●	●				◯	◯	◯
Cement masons and terrazzo workers			●		●		●	●	●	●				◯	●	◯
Drywall installers and finishers							●	●	●					◯	●	◯
Electricians (construction)			●				●	●	●	●				●	◯	◯
Floorcovering installers						●	●	●						○	◯	◯

	Job requirements									Work environment			Occupational characteristics			
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Glaziers			●		●		●	●	●	●				○	○	○
Insulation workers							●	●	●					○	●	○
Ironworkers					●		●	●	●	●				●	○	○
Painters and paperhangers						●	●	●	●	●				○	○	○
Plasterers							●	●						○	○	○
Plumbers and pipefitters			●			●	●	●	●	●				●	○	○
Roofers					●		●	●	●	●				○	○	○
Sheet-metal workers			●				●	●	●					○	○	○
Tilesetters							●	●						○	●	○
Extractive occupations																
Coal mining operatives							●		●	●	●	●		○	●	○
Production Occupations																
Blue-collar worker supervisors		●	●	●	●		●		●					○	○	○
Precision production occupations																
All-round machinists			●				●	●	●		●			○	○	○
Automobile repair service estimators	●	●	●		●	●	●							○	○	○
Boilermaking occupations			●				●		●					○	○	○
Bookbinders and bindery workers			2				●	●	●		●	2		○	○	○
Compositors							●	●	●		●			○	○	○
Coremakers (foundry)							●	●			●			○	○	○
Dental and laboratory technicians							●							○	●	○
Dispensing opticians							●							1	●	○
Furniture upholsterers							●	●			●	●		○	○	○
Instrument makers (mechanical)			●	●	●		●				●	●		○	○	○
Jewelers			●	●	●		●				●		●	○	○	○
Lithographers							●				●			●	●	○
Molders (foundry)							●	●	●		●			○	○	○
Ophthalmic laboratory technicians							●				●			○	○	○
Patternmakers (foundry)							●	●			●			●	○	○
Photoengravers							●				●			1	○	○
Photographic process workers							●				●			○	○	○
Shoe repairers							●							○	○	○
Tool-and-die makers			●				●	●	●		●			●	○	○

World of Work

	Job requirements								Work environment			Occupational characteristics				
	1. Leadership/persuasion	2. Helping/instructing others	3. Problem-solving/creativity	4. Initiative	5. Work as part of a team	6. Frequent public contacts	7. Manual dexterity	8. Physical stamina	9. Hazardous	10. Outdoors	11. Confined	12. Jobs concentrated geographically	13. Part-time	14. Earnings	15. Employment growth	16. Entry requirements
Plant and system operators																
Stationary engineers			●				●	●	●					◯	○	◯
Waste-water treatment-plant operators			●	●			●		●	●				○	○	◯
Machine operators, tenders, and setup workers																
Boiler tenders							●	●		●				◯	○	◯
Electrotypers and stereotypers							●	●			●			◯	○	◯
Forge shop occupations							●	●		●		●		◯	○	◯
Machine tool operators			●				●	●		●	●			◯	◯	◯
Machine tool setup workers			●				●			●	●			◯	◯	◯
Printing press operators and assistants							●	●	●		●			◯	○	◯
Production painters							●	●	●		●			○	◯	○
Fabricators, assemblers, and hand working occupations																
Assemblers					●		●				●			○	◯	○
Automotive painters							●	●	●		●			●	●	◯
Welders and flamecutters							●	●	●	●				◯	◯	◯
Transportation and Material Moving Occupations																
Motor vehicle operators																
Intercity busdrivers				●		●	●	●			●		●	●	○	◯
Local transit busdrivers				●		●	●	●			●		●	◯	●	◯
Local truckdrivers				●			●	●			●			◯	◯	○
Long-distance truckdrivers				●			●	●			●			●	◯	◯
Other transportation and material moving occupations																
Airplane pilots			●	●	●		●				●			●	○	◯
Merchant marine officers		●	●	●	●		●		●	●	●	●		●	○	●
Merchant marine sailors					●		●	●	●	●	●	●		◯	○	◯
Operating engineers (construction machinery operators)							●		●					◯	○	◯
Helpers, Handlers, Equipment Cleaners and Laborers																
Construction laborers					●		●	●	●	●				○	◯	○

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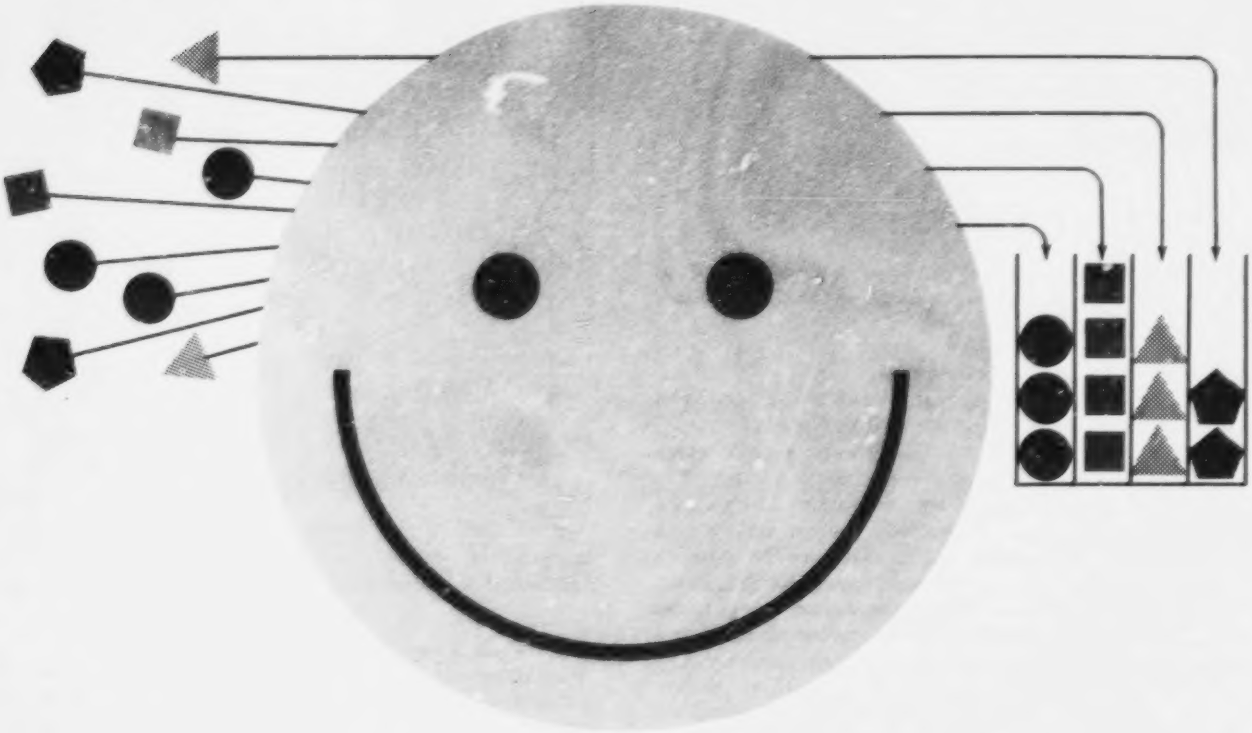
[1] Estimates not available.
[2] Vary, depending on job.



The Joy of Classifying:

A Counselor's Guide to Taxonomies and Crosswalks

by Neale Baxter

Juliet was right. The perfume of the rose does not depend on its name. Nor has anyone's enjoyment of a BLT on toast ever been increased by knowing that the luscious, juicy tomato is next of kin to the starchy, crunchy potato. But a gardener with a similar disregard for nomenclature who planted ragweed instead of roses or a farmer who didn't know that the wilt attacking the potatoes could also kill off the tomatoes would be a pretty poor gardener or a very hungry farmer.

Standardized names for plants—and occupations—enable us to be certain that we mean the same thing when we use the same word; and taxonomies—or classification systems—highlight the similarities among the items grouped together. In career counseling, for example, a taxonomy enables a counselor, client, or student to discover suitable occupations that might have been overlooked if only the best known lines of work had been investigated.

Given the usefulness of good classification systems, vocational counselors should be jumping out of bed each morning in joyful anticipation of another day spent wandering through occupational taxonomies. Such eagerness to tangle with a taxonomy has rarely been observed, however. The systems are a trifle confusing, although they are often less complicated than others used daily by counselors, systems such as the classification of all books according to Dewey's decimals or the division of all knowledge into the standard subjects of a curriculum. Certainly one difficulty with the occupational taxonomies, at least at present, is their number. Each of the different systems, however, yields information that might prove crucial to a counselor's ability to assist a particular individual. Knowledge of the kind of data orga-

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nized in each major taxonomy can help a counselor figure out where to turn when no answer appears in the *Occupational Outlook Handbook*.

A Gaulish Approach to Taxonomies

Jobs can be classified in as many ways as the cheeses of France; but like ancient Gaul, the various systems for classifying jobs can be divided into three groups, each of which puts the same worker into a different context. First, we can look at the tasks performed by the worker; this yields a classification system for occupations. Second, we can look at the product made or service rendered by the worker's employer; this yields a classification system for industries. Third, we can look at the training the worker brings to the job; this yields a classification system for instructional programs. Crosswalks allow users to move from one taxonomy to another of the same kind—such as occupations—an important ability because the data collected or presented according to one system are often unavailable in another; after all, users want the information, not the taxonomy, which is merely a tool for organizing it.

Because the information sought determines which programs for collecting data must be consulted—and therefore, which taxonomy the data are arranged by—a rundown of the types of information of interest to career counselors might be handy. The following list could be much longer, but it is sufficiently cumbersome as it is. Counselors, and the people they work with, need the following information about an occupation:

- Title
- equipment and material used
- duties performed
- product made or service rendered
- ability required
- training required
- work environment
- work schedule
- salary scale
- other benefits, such as vacations and health insurance
- entry route
- potential for advancement
- number employed
- unemployment rate
- projected demand for the short term
- projected demand for the long term
- projected supply for the short term
- projected supply for the long term
- the relation of demand to supply.

The descriptions of the taxonomies and their related publications in this article indicate which of these items of information are available in the taxonomy.

Apples Are Roses Too

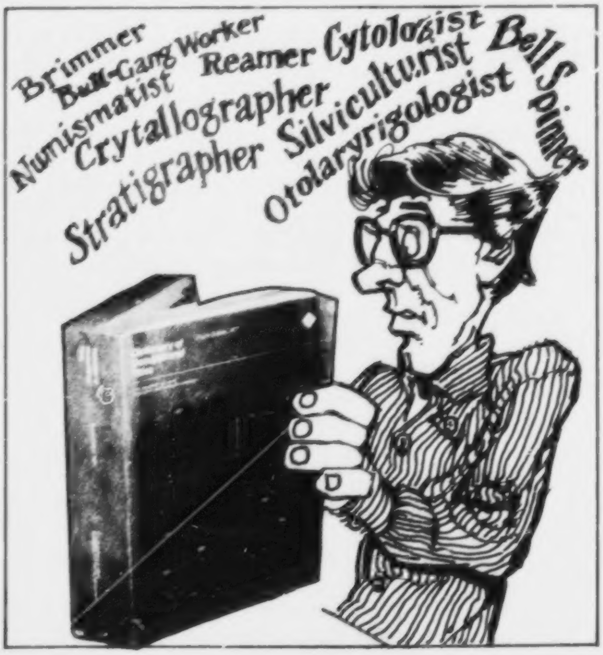
How things are grouped together depends on which of their characteristics are considered significant. For example, we usually think of an apple as a fruit tree and of a rose as a flower bush, the fruit and the flowers being important to us. But a botanist, looking at the blossoms of the apple and the rose, would find the two plants similar and put them in the same genus, *rosa*. Similarly, even after a decision has been made to classify occupations according to the tasks workers perform, a particular system must still be chosen. And the classification schemes for the plant world have nothing on the systems used to count, classify, describe, define, group, categorize, sort, index, codify, and pigeonhole the tasks performed by workers. The best known, most frequently used systems, such as those developed by the U.S. Employment Service and the U.S. Census Bureau, are national in scope and describe the total range of occupations found in the United States. Many others are more selective, being concerned with the workers in a single State or industry. And yet other systems have been developed by commercial firms and private research organizations. Among the occupational taxonomies for particular industries are the Cooperative Health Statistics System, the Program for Estimating Employment Opportunities in Agribusiness, and the Hired Farm Working Force Survey's system.

Each of these systems satisfies somebody, but their number satisfies no one. So, a few years ago, the call went forth for a savior—a mighty hero who would slash through duplications, wrest consistency out of confusion, and impose order on chaos. The hero's name is SOC, the Standard Occupational Classification System. It has not conquered its world with the speed of Alexander; nor is victory secure. But, as shall be seen, some battles have been won, and at least the way to victory can be seen. Speaking less figuratively, after years of going off in separate directions, the people who develop taxonomies are now trying to make their systems compatible.

The world is coming to the SOC, but the future is not now, so a counselor seeking information must still be familiar with the other, older systems: Those wide in scope and those specialized in purpose. Furthermore, even after the SOC becomes widely used, the need to use other systems, such as those for instructional programs, will remain. Knowledge of the crosswalks that link the systems together is also needed. The time has come to speak of DOT's and OES's and OIS's, subjects of no less importance than cabbages and kings.

By Their DOT Code You Shall Know Them

The *Dictionary of Occupational Titles* (DOT) is the most comprehensive list of jobs available for the United States. It gives the occupation's title and states the equipment and material used, duties performed, and product made or service rendered. Its main entries, to use a librarian's term, describe the duties of 12,000 occupations and mention another 16,000 job titles. The codes assigned to occupations in it are used in countless publications and as a filing system by many counselors and career information centers. It will not tell you everything you want to know about an occupation, but it's a good place to start.



The DOT has nine parts:

- Introduction—a history of the book, an explanation of a typical definition; an explanation of how to use the book; and a list of the 9 occupational categories, 82 occupational divisions, and more than 500 occupational groups among which occupations are divided.
- Master Titles and Definitions—lengthy definitions of 15 words like *helper* that refer to a large number of jobs with similar duties.
- Term Titles and Definitions—definitions of a hundred or so words like *ecologist* that refer to jobs with different duties.
- Occupational Group Arrangement—the 900-page raison d'être for the *Dictionary*, the 12,000 definitions, arranged by DOT number. Each entry provides the code for the occupation; briefly describes the worker's duties; specifies material and equipment used, product made, and service rendered; and mentions related occupations.
- Glossary—definitions of technical words used in the DOT and not found in standard dictionaries.
- Alphabetical Index of Occupational Titles—the means of finding the definition when only the job's name is known.
- Occupational Titles Arranged by Industry Designation—an especially useful feature for counselors who work in areas dominated by one or two industries; this index groups occupations according to the industry in which they are generally found.
- Industry Index—a 5-page list of the industries under which occupations are grouped in the preceding section.
- Appendix: Explanation of Data, People, and Things—a description of the coding system used to derive the middle 3 digits of a DOT number, which signal the degree to which a worker deals with data, people, and things.

Familiarity with DOT codes, as opposed to the definitions, mainly comes in handy when using another publication—such as a Job Bank printout—that is arranged by the numbers but has no index. The codes themselves are a logical though artificial imposition of order onto the confusing myriad of jobs defined. Occupations with similar duties are grouped together, at least by the first and last sets of 3 digits in the 9-digit code. The middle 3 digits, as stated above, are designed to give succinct information about the level at which the worker deals with data, people, and things, the lowest number corresponding to the highest level.

Every effort was made to insure the validity of the worker-function codes, but when counseling an individual, it would be well to remember that the codes reflect a national consensus; specific positions in a local company may require relatively more or less skill than is usual for the occupation. For example, the "things" code for material handler is 7, which is fairly low. However, it is likely that some material handlers work with things at a more complicated level. The national scope of the DOT is, in fact, its major drawback. Its major usefulness is the provision of a first idea of what a job entails.

The DOT contains all the news about occupations that will fit in 1,300 pages of small print; but it doesn't contain all that a counselor or client wants to know. It doesn't even contain all that the U.S. Employment Service knows. Consequently, the Employment Service publishes much additional material, such as the *Guide for Occupational Exploration,* various career guides, *Selected Characteristics of Occupations Defined in the "Dictionary of Occupational Titles,"* and numerous publications related to State and local Job Banks.

Field Guides to the Jobs of North America

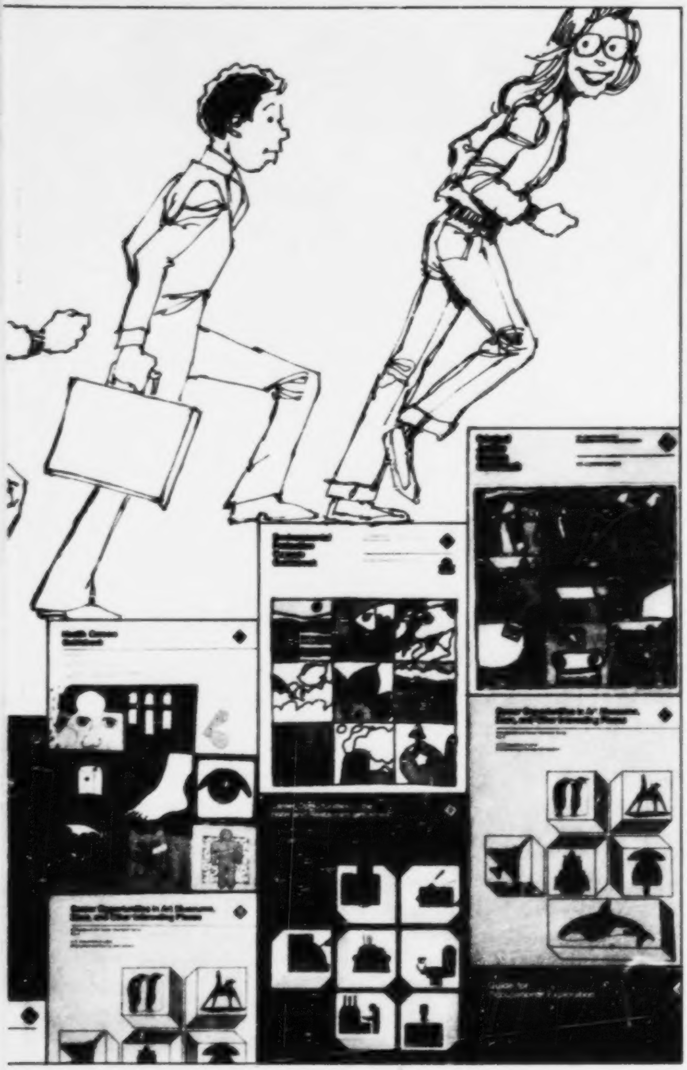
The many guides to occupations developed by the Employment Service are rich sources of information that will prove useful to every counselor.

The *Guide for Occupational Exploration* focuses on the interests and aptitudes that characterize workers in different jobs. It provides information on an occupation's title; on a worker's duties, ability, and training; and on the usual entry route for the occupation. Jobs are divided among interest areas, work groups, and subgroups. The interest areas, related to on John Holland's Occupational Categories, are 12 in number: Artistic, scientific, plants and animals, protective, mechanical, industrial, business detail, selling, accommodating, humanitarian, leading-influencing, and physical performing. The organization of the *Guide* thus differs completely from that of the DOT. Coincidentally, however, the *Guide,* like the DOT, has nine parts:

- Introduction—an explanation of the *Guide's* purpose and organization.
- Use of the Guide in Career Exploration—step-by-step directions for using the *Guide* without the assistance of a counselor.
- Definition of Interest Factors—one-sentence definitions of the 12 interest areas; for example, "Protective: Interest in the use of authority to protect people and property."
- Summary List of Interest Areas, Work Groups, and Subgroups—the titles and *Guide's* code numbers for the 12 interest areas, 66 work groups, and 348 subgroups.
- Area and Work Group Arrangement—the core of the book, running just over 300 pages; its contents are described in the next paragraph.
- Appendix A: Technical Development of the Interest Factors and the *Guide*—a discussion of the procedure followed in assigning occupations to an interest area.
- Appendix B: USES Interest and Aptitude Tests—an index by the *Guide's* codes to the 450-plus occupations for which the Employment Service has developed Specific Aptitude Test Batteries.
- Appendix C: Use of the Guide in Organizing Occupational Information Resources—a method to follow in setting up a filing system.
- Appendix D: Alphabetical Arrangement of Occupations—a 379-page index by DOT title to the *Guide's* codes.

The "Area and Work Groups Arrangement" is likely to be the most useful section of the *Guide* for people who are not receiving vocational counseling. For each of the 66 work groups covered, it answers the following five questions:

- What kind of work would you do in these jobs?
- What skills and abilities do you need for this kind of work?
- How do you know if you would like or could learn to do this kind of work?
- How can you prepare for and enter this kind of work?
- What else should you consider about these jobs?



The answers are clear and forthright. For example, the skills and abilities needed to do "Elemental Work: Industrial" are to "follow instructions carefully; adjust to doing the same thing over and over; move or lift heavy objects; and pay attention to safety rules when working around machinery." In answer to "What else should you consider about these [Elemental Work: Industrial] jobs," the *Guide* states, "Many people accept jobs in this group as their first full-time employment. As they develop experience and skills, they may advance to other jobs in the work setting." The answer to the fifth question, "What else should you consider about these jobs," is followed by a list of all the job titles in the DOT that belong in the work group. The list is divided into subgroups, but additional information about the jobs must be sought either in the DOT, as the *Guide* directs, or elsewhere. The lists vary enormously in length. Group 12.01, Sports, contains only 30 job titles; Group 06.04, Elemental Work: Industrial, has 45 pages of job titles, which might be too much of a good thing for people unfamiliar with the diversity of occupations in the country.

For those who learn the *Guide's* arrangement and become adept at its use, the book's major shortcoming, like that of the DOT, is that it provides nationally relevant information that might fail to reflect local terminology.

Besides the *Guide* and the DOT, the Employment Service has produced several other career guides. Although not taxonomies, these books are byproducts of the Employment Service's occupational analysis program. The first one published after the current edition of the DOT was the *Health Careers Guidebook,* followed by the *Environmental Protection Careers Guidebook,* and the *Criminal Justice Careers Guidebook.* Yet another series of books prepared by the Employment Service describes occupations in various industries. Thus far, four titles have appeared: *Career Opportunities in Telephone and Telegraph Industries; Career Opportunities in the Trucking Industry; Career Opportunities in the Electric Power and Gas Utilities Industries; Career Opportunities in Hotels and Restaurants;* and *Career Opportunities in Art Museums, Zoos, and Other Interesting Places.* In addition to the kind of information found in the DOT, these books usually describe working conditions, ability and training required, entry routes, and the potential for advancement. The contents vary somewhat from one to another, however, in order to make the individual books more useful. For example, *Health* contains a section on financial aid and *Trucking* has a glossary of 18-wheeler jargon. Budgetary restraints and personnel cutbacks have forestalled the publication of additional guides.

Beyond Data, People, and Things

Toward the beginning of this article, the claim is made that some information about jobs is only accessible through the taxonomies. The information in *Selected Characteristics of Occupations Defined in the "Dictionary of Occupational Titles"* is a case in point. To find a job in *Selected Characteristics,* you must know its DOT code and subgroup number in the *Guide for Occupational Exploration,* the books described in the previous section of this article. *Selected Characteristics* does include an index by DOT number, but it has no index by job title. Once you find an occupation, however, *Selected Characteristics* will take your knowledge of an occupation several steps past the worker-function codes of the DOT.

For every occupation defined in the DOT, *Selected Characteristics* provides encapsulated information on five subjects: Physical demands, environmental conditions, mathematical development, language development, and specific vocational preparation. The information is conveyed through a series of letters and numbers printed in five columns that correspond to the five subjects. The codes, which are explained in a group of appendixes beginning on page 465 of the book, enable fairly fine distinctions to be drawn for each topic.

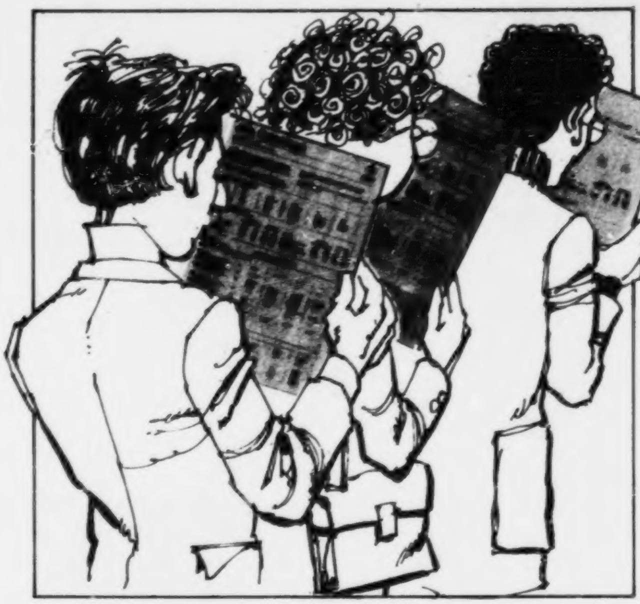
The first occupation listed in the book, "reader," can serve as an example for them all. It receives the following annotation: Physical demands—S6; environmental conditions—I; mathematical development—2; language development—5; specific vocational preparation—6.

S6 means that a reader engages in sedentary work and must be able to see. Besides S for sedentary, there are codes for light, medium, heavy, and very heavy work, each referring primarily to the maximum weight of objects a worker would usually be required to lift or carry or push or pull. And in addition to 6 for seeing, numbers in the physical demands column signal a worker's need to climb and balance; stoop, kneel, crouch, and crawl; reach, handle, finger, and feel; and talk and hear.

For every occupation, the letters I, O, or B indicate whether people work inside, outside, or both. Six other environmental conditions are described numerically, namely extremes of cold plus temperature changes; extremes of heat plus temperature changes; wet and humid; noise and vibrations; hazards; fumes, odors, toxic conditions, dust, and poor ventilation.

Mathematical and language development are both measured against a 6-point scale with the lowest number indicating least development (the opposite of the sequence used in the data-people-things codes of the DOT). The mathematical knowledge needed at each level is quite clearly marked. For example, at level 6 a person would work with limits, continuity, real number systems, mean value theorems, and implicit function theorems. At level 5, the ability to apply concepts of analytical geometry, differentiation, and integration of algebraic functions with applications would be expected. Language development, after the two lowest levels, is not so clearly differentiated, however. For example, at level 3 one should be able to read a variety of novels, at level 4 one must read novels, level 5 is the same as level 6 (although both numbers are used in the annotations) and at level 6 one reads literature. The vagueness of the standards for language development doubtless helps explain why level 6 is ascribed to many scientific and technical occupations while half the occupations grouped under "literary arts" are characterized by lower levels of language development.

The time required for specific vocational preparation is divided into 9 categories ranging from a short demonstration to over 10 years, the higher number indicating the longer period. The training received in schools and on the job is indicated in the same sequence of numbers, so a user of *Selected Characteristics* will not be told whether an occupation received an 8 because of a long, more or less formal training period, as with many of the medical specialties, or because of the work experience required, as with many supervisory jobs.



The difficulty of determining the level of language development or specific training that a worker must bring to a job throws into relief one drawback of *Selected Characteristics.* As stated in a special notice, "The user should be cautious in interpreting the information in this publication. Occupational definitions are composite descriptions of occupations as they may typically occur and may not coincide with a specific job as actually performed in a particular establishment or in a given industry." Nevertheless, once cracked, the codes in *Selected Characteristics* do convey a remarkable amount of information about thousands of occupations, information not readily available elsewhere.

Bank Withdrawals

Job Banks are computer-generated lists of all unfilled job openings for a local, State-operated, Employment Service office. For each job, they give information on job location, occupational title and DOT code, wage, employer, and education or skill required. Job Banks do not list anything like all the openings available in an area, but they usually do include a larger number of bonafide vacancies than any other single source of information, such as a newspaper or an employment agency.

Since practically every State Employment Service agency operates Job Banks—at least in the major labor markets—and since each Job Bank issues a new listing every working day, even a speed reader would quickly drown in the steady flood of information they publish. The U.S. Employment Service, therefore, makes the data available through four other publications:

- *Employment Security Automated Reporting System* (ESARS) *Reports*
- *Job Bank Frequently Listed Openings* (JOB FLO)
- *Job Bank Openings Summary Data* (JBOS)

- *Jobs in Demand* (formerly *Occupations in Demand at Job Service Offices*).

Taken together, the reports form a solid pyramid of information with the ESARS reports at the base and *Jobs in Demand* at the apex.

An ESARS report, which is prepared by a State Employment Service agency, is a group of tables that present information related to the job orders received and applicants assisted by the Job Service in a State. Some tables are prepared monthly, some quarterly. Information is always presented for the State as a whole but, frequently at the discretion of the State, it might also be presented for a region or metropolitan area within the State. Many of the tables, such as the one on Food Stamp Work Registrants served, would be of no interest to a counselor. But other tables can provide insight into local labor market conditions. Tables 7A and 7B, for example, report the number of job openings listed with the Job Service by occupation and hourly wage. Tables 9 and 10 concern placements and job openings by industry and occupation. In all four cases, only 13 occupational categories—those established by the first two digits of a DOT code—are listed. Probably the most informative table for a counselor is table 96, which presents data on both registrations and placements for almost 1,000 occupations. Besides reporting the number of people registered and placed for the occupations, table 96 also has information on such subjects as sex, veteran status, and age.

JBOS is somewhat more selective than the ESARS reports, but data are presented for the whole country. It is published monthly on microfiche. It provides information on the number of openings available and the pay scale for some 800 occupations. JBOS was discontinued in the Spring of 1982 but may be resumed if funds permit.

JOB-FLO, published on both paper and microfiche, is also national in scope. Only occupations for which high demand was recorded are listed, the standard depending on the size of the Job Bank receiving the orders. JOB-FLO has three tables for each Job Bank district. Table 1 lists occupations by DOT code and industry. Table 2 details the number of openings and the pay scale for each occupation. And table 2A indicates the education and experience required for the openings in the occupations listed. JOB-FLO was also discontinued in the Spring of 1982 but may be resumed if funds permit.

Jobs in Demand is the most selective, the most readily available, and the most accessible report of all. Published monthly in newspaper format, it lists the occupations for which demand was highest at Job Service offices the previous month. Besides the number of openings available, the report also states where the openings were, the pay range, and the number of openings that remained unfilled at the end of the period.

Individuals can also learn of Job Bank openings for which they qualify through the Job Service Matching System, available in about 20 States. It enables a Job Service office in one State to perform a computer search of the Job Banks in all the other States, specifying such information as occupational skills and salary range. Also available in every Employment Service office is a microfiche listing of selected jobs from all the Job Banks; it is distributed weekly.

SOC It to Them

The *Standard Occupational Classification Manual* (SOC), which was published by the Department of Commerce's Office of Federal Statistical Policy, is designed to make the various taxonomies used by the Federal Government compatible with each other. First published in 1977, a revised edition appeared in 1980. Among its first fruits will be the reports based on the 1980 Census. The *Manual* is not intended to replace the DOT—it has definitions only for occupational groups, not for individual occupations—but it will be used more and more as a way to organize and report data about jobs.

The sorting out process used by the SOC to classify occupations has four levels: Division, major group, minor group, and unit. An SOC number likewise has four digits, but the first two numbers correspond to a major group; the third and fourth correspond to the minor group and unit group respectively. The unit groups are followed by listings of appropriate DOT titles, so that every DOT code is accounted for by the SOC. Familiarity with DOT numbers is necessary when working with some publications, such as Job Bank printouts. Familiarity with SOC numbers is not now needed when using other publications. However, a general knowledge of the sequence of occupational groups can be helpful when using books or tables, such as those on the 1980 Census of the Population, arranged along the same lines as the SOC.

Classifying

Some OOQ readers may already be familiar with the SOC's organization because it was used in the current *Occupational Outlook Handbook*. At any rate, the classification of occupations in the SOC does not differ much from that in the DOT, as can be seen by comparing the titles of the major divisions in the two systems:

DOT Occupational Categories	SOC Divisions
Professional, technical, and managerial occupations	Executive, administrative, and managerial occupations
	Engineers, surveyors, and architects
	Natural scientists and mathematicians
	Social scientists, social workers, religious workers, and lawyers
	Teachers, librarians, and counselors
	Health diagnosing and treating practitioners
	Registered nurses, pharmacists, dietitians, therapists, and physician's assistants
	Writers, artists, entertainers, and athletes
	Health technologists and technicians
	Technologists and technicians except health
Clerical and sales occupations	Marketing and sales occupations
	Administrative support occupations including clerical
Service occupations	Service occupations
Agricultural, fishery, forestry, and related occupations	Agricultural, forestry, and fishing occupations
Processing occupations	Mechanics and repairers
Machine trades occupations	Construction and extractive occupations
Benchwork occupations	Precision production occupations
Structural work occupations	Production working occupations
Miscellaneous occupations	Transportation and material moving occupations
	Handlers, equipment cleaners, helpers and laborers
	Military occupations
	Miscellaneous occupations

The SOC has a larger number of divisions than the DOT has categories, but paradoxically, the DOT carries its system further, providing finer detail. One consequence of the SOC's system is that instead of classifying transportation and handling jobs as miscellaneous in the manner of the DOT, it finds a home for all but four occupations. The four occupations in the SOC that, to quote the *Manual*, "cannot be classified in any other division" are graduate assistant, supervisor, consultant, and scuba diver.

The SOC *Manual* contains—besides a 330-page list and description of the occupational categories—definitions of master and term titles, a thorough index, and a list of DOT industry codes.

Making Sense Out of The Census

Every 10 years, the Census Bureau sinks a well into the country's demographic oil basin and brings up enough crude data to keep computers running for a decade. Most of the information, of course, has nothing to do with occupations, but Census does ask one person in six what industry they work in and what kind of work they do. Answers to these questions can be cross tabulated with other census data to yield an enormous array of statistical information about jobs. Typically, information is available on the industry, income, education, age, race, national origin, and geographic area of workers in hundreds of different occupations.

As already said, this time around, the tables conveying the data will be organized according to a system based on the SOC. The classification developed for the 1980 Census of the Population has 503 occupational categories. Many Census categories relate to one SOC unit group. But some are combinations of SOC unit groups; and, in a few places, Census has divided an SOC unit group.

Publications for the latest Census have just begun to appear. As of August 1982, only provisional estimates for six broad groups of occupations had appeared. Plans call for State data to be published in a four-chapter volume called *Characteristics of the Population*. Data on occupations will appear in two of these chapters. Chapter C has about 50 occupational groups and shows data for States, Standard Metropolitan Statistical Areas (SMSA's), places of 2,500 or more population, and counties. The detail is greatest for the larger places. Chapter D will show nearly all the occupations for some tables. That chapter will include data for States and SMSA's of 250,000 or more.

The Census Tract reports will contain the 13 major occupational groups used by Census. These data will come out on a flow basis during 1983. The data for small areas available from the Census can be especially helpful as a supplement to the national data appearing in books like the *Occupational Outlook Handbook*.

Occupational Earnings From Top to Bottom

by Peter Ward

"How much does it pay?" is one of the first questions workers ask when appraising a job. Whether the pay is satisfactory often depends not only upon the dollar amount offered but also upon how much could be earned at some other type of job the worker might qualify for. But it is sometimes difficult to compare earnings between occupations because the information is expressed in different ways; hourly rate, yearly salary, weekly base rate plus tips or incentive earnings, for example. This shortcoming has now been reduced, however, thanks to a new source of data. An expanded Bureau of Labor Statistics survey now asks a cross-section of householders, "How much does . . . usually earn per week at this job before deductions? Include overtime, commissions, or tips usually received." The answers make possible comparisons between a larger number of occupations than had been the case previously.

The results of the latest survey are presented in the ranking of earnings on the following pages. The table presents 1981 usual weekly earnings for 247 occupations, each employing at least 50,000 wage and salary workers full time. For a breakdown on earnings by sex, see "Earnings of Men and Women: A Look at Specific Occupations" by Nancy F. Rytina in the April 1982 issue of the *Monthly Labor Review*.

Several points must be kept in mind in comparing the earnings in this ranking: The figures relate to earnings from wages and salaries only; earnings from self-employment, which tend to be higher than earnings from salaries, are not included. Thus physicians, many of whom are self-employed, have the highest earnings among all occupations, but they are 14th in this ranking because these data relate only to doctors who worked for someone else, such as a clinic or a government agency. To help alert readers to the possible understatement of true earnings for some jobs in this ranking, the table contains information on self-employment. The percentage of self-employed workers is shown in the table if it exceeds 25 percent; no figure is given if less than 25 percent

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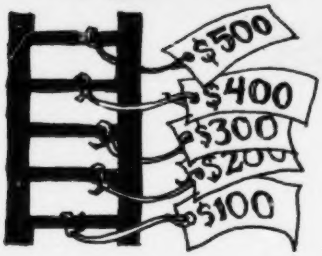

of all workers in the occupation are self-employed. Also, keep in mind that the figures represent not only the high earnings of, for example, the 60-year-old tool and diemaker with many years of seniority and wage increases, but also the newly hired high school graduate reporting for the first day of work. The weekly earnings may therefore seem low. They are more an indication of possible earnings on the way up the career ladder than the ultimate salary you might expect.

Finally, keep in mind that within the single occupation earnings can vary enormously. An article in the Spring 1982 *OOQ*, "Average Salaries . . . and Why They're Not So Average" explains why. If you work in Boston you will probably earn less than if you work in San Francisco. If you're in the petroleum refining industry, you'll probably earn more than a similar worker in the men's suit industry. If employed by a large company, you'll probably earn more than you would in a small firm in the same industry. These are a few of the factors that have a bearing on how much you could make in an occupation. Good wages are paid in many types of jobs. The trick is to get a job in an area you like and can be good at.

Engineers Do Well

For ease of comparison, the ranking of earnings can be divided into three groups—top, middle, and lowest level. Not surprisingly, workers with the highest levels of education were in the top income category. Managerial and professional and technical workers predominated in this group. Nineteen of the top 20 jobs were in one of these groups. The only exception was "stock and bond sales agents," which is a sales job.

Within the professional group, engineering specialties clearly stand out in the ranking, accounting for 7 of the top 20 occupations. Weekly earnings in those specialties ranged from $619 for aerospace and astronautical engineers to $507 for civil engineers. Although restricted only to the wage and salary earnings, the median usual weekly earnings of lawyers ($574) and physicians ($561) nonetheless were in the top 20 of the ranking.

The top 20 also included a number of technical and administrative occupations. Among high earning technical jobs are economists, airplane pilots, computer system analysts, and operations and systems researchers and analysts. Among well paying administrative occupations are school administrators at the college, secondary, and elementary levels; health administrators; and bank officers and financial managers.

Many craft workers were in the top third of the ranking, although they were concentrated near the bottom half of the group. Earning more than $400 a week were such specialists as structural metal crafts workers, millwrights, tool and die-makers, aircraft mechanics, and electricians.

Although not revealed by data in the table, a separate analysis shows that many of the jobs that pay well will also be growing rapidly in the years ahead. Roughly half of the 20 jobs expected to grow the fastest (percentage increase) between 1980 and 1990 had earnings in the top third of the ranking. Among jobs with top earnings and employment growth expected to exceed 40 percent are computer systems analysts, computer programmers, aero-astronautic engineers, economists, brickmasons, and data processing machine mechanics.

Workers in the middle third of the ranking (83-164) earned roughly $250-$300 a week. Included in this group are many types of workers, although operatives, such as assemblers, and clerical jobs are very common. At the exact middle of the ranking (125) stands "painters and sculptors," earning nearly $300 a week. The kinds of jobs that cluster around this wage illustrate the widely varying types of jobs that can pay similar amounts. Earning a few dollars a week more than painters and sculptors were bus drivers; sales managers, retail trade; crafts workers not elsewhere classified; and therapists. Earning just a few dollars less were clinical laboratory technologists; auto body repairers; and hucksters and peddlers.

Only a few workers classified in the professional and technical category were included in the middle third of the ranking: Elementary and kindergarten teachers, clergy, dietitians, social workers, registered nurses, and foresters. These occupations are traditionally low paying, and, except for clergy and foresters, are held largely by women.

Jobs in the lowest third of the ranking (165-247) are concentrated in the service and farm sectors. The lowest paying nonfarm occupations—typically paying $125 to $150 a week—include many jobs held by young, inexperienced workers and older people with few skills or intermittent attachment to the work force. Such jobs often pay about the Federal minimum wage and include dishwashers, cleaners, food counterworkers, and child-care workers. Other low paying jobs, in the $150-$200 range, are teachers aides, nurses aides and orderlies, dental assistants, library attendants and assistants, bank tellers, clerks, and bartenders.

Of the 20 occupations expected to offer the largest number of openings through 1990, 13 have earnings in the lowest third of the ranking. Of the 13, none had earnings higher than secretaries (less than $230), the occupation with the largest number of expected openings through 1990. OOQ

Weekly Earnings by Occupation

Rank	Title	1981 weekly earnings	Percent self-employed	1981 employment (thousands)
1	Engineers, aeronautical and astronautical	614		82
2	Engineers, chemical	575		65
3	Engineers, electrical	549		370
4	Lawyers	546	35.5	548
5	Engineers, mechanical	540		247
6	Sales managers, except retail trade	540		367
7	Economists	536		157
8	Stock and bond sales agents	535		156
9	Engineers, industrial	530		231
10	Airplane pilots	530		80
11	Engineers, other	527		241
12	Computer systems analysts	519		209
13	Engineers, civil	505		183
14	Physicians—medical and osteopathic	501	31.0	436
15	School administrators, college	491		137
16	Operations and systems researchers	485		196
17	School administrators—elementary and secondary	475		289
18	Chemists	467		134
19	Authors	464	62.0	71
20	Pharmacists	463		147
21	Structural metal crafts workers	455		80
22	Millwrights	443		102
23	Officials, public administration	441		469
24	Sales representatives, manufacturing	434		410
25	Tool, diemakers	433		170
26	Health administrators	431		216
27	Other managers, administrators	431		6504
28	Officials of lodges, unions	429		116
29	Architects	428	32.0	91
30	Aircraft mechanics	427		119
31	Biological scientists	423		57
32	Computer programmers	422		357
33	Designers	421		213
34	Electricians	419		639
35	College and university teachers, nec	417		66
36	English teachers	416		53
37	Mine operatives, nec	413		260
38	Health specialties teachers	412		52
39	Telephone installers, repairers	412		318
40	Bank officers and financial managers	411		680
41	Musicians and composers	409		142
42	Electric power line installers	409		115
43	Ticket station, express agents	407		144
44	Mail carriers, postal service	406		239
45	Railroad and car shop repairers	405		59
46	Plumbers and pipefitters	404		449
47	Personnel and labor relations specialists	402		432
48	Public relations workers	402		121
49	Crane, derrick, hoist operators	402		141
50	Brickmasons and stonemasons	401		147
51	Postal clerks	400		263
52	Sales representatives, wholesale trade	396		951
53	Data processing machine mechanics	395		97
54	Psychologists	394		115
55	Adult education teachers	394		75
56	Blue-collar worker supervisors	394		1790
57	Drillers, earth	393		59
58	Purchasing agents and buyers, nec	390		260
59	Vocational and educational counselors	388		186
60	Electrical and electronic technicians	387		267
61	Telephone line installers and repairers	387		77
62	Sheet metal workers and tinsmiths	381		147
63	Inspectors, except construction, public administration	380		108
64	Accountants	379		1096
65	Stationary engineers	375		178
66	Furnace tenders, smelterers, and pourers	374		62
67	Inspectors, other	370		141
68	Writers, artists, and entertainers, nec	363		109
69	Police and detectives	363		503
70	Research workers, nec	362		188
71	Firefighters	362		210
72	Job and die setters, metal	358		93
73	Machinists	356		557
74	Dry wall installers, lathers	356		79
75	Dentists	352	72.0	127
76	Chemical technicians	352		101
77	Dental hygienists	351		54
78	Secondary school teachers	351		1213
79	Editors and reporters	351	31.0	202
80	Credit managers	351		66
81	Heavy equipment mechanics, including diesel	346		986
82	Radio, television repairers	346		107
83	Engineering and science technicians, nec	344		243
84	Glaziers	344		51
85	Drafters	343		332
86	Furnace tenders, stokers, except metal	342		78
87	Insurance agents, brokers, and underwriters	341		584

Occupational Earnings

Weekly Earnings by Occupation

Rank	Title	1981 weekly earnings	Percent self-employed	1981 employment (thousands)
88	Excavating, grading, and road machine operators, except bulldozer	337		314
89	Air conditioning, heating, and refrigeration mechanics	335		207
90	Asbestos, insulation workers	335		53
91	Advertising agents and sales workers	334		126
92	Welders and flame cutters	334		709
93	Registered nurses	332		1313
94	Sales workers, services and construction	332		237
95	Foresters and conservationists	331		57
96	Clerical supervisors, nec	331		246
97	Expediters and production controllers	328		249
98	Dispatchers and starters, vehicle	327		113
99	Bulldozer operators	327		99
100	Office machine repairers	327		73
101	Real estate agents and brokers	326	33.0	546
102	Carpenters	325		1080
103	Sheriffs and bailiffs	324		69
104	Cement and concrete finishers	323		63
105	Other mechanics and repairers	323		234
106	Elementary school teachers	322		1389
107	Lathe and milling machine operatives	322		101
108	Librarians	320		276
109	Printing press operators	320		163
110	Estimators and investigators, nec	319		529
111	Buyers, wholesale and retail trade	316		191
112	Meat cutters and butchers, except manufacturing	316		173
113	Truck drivers	314		1843
114	Office managers, nec	313		494
115	Teachers, nec, except college and university	312	46.0	229
116	Grinding machine operatives	312		134
117	Surveyors	310		88
118	Social workers	309		383
119	Photographers	309	32.5	99
120	Household appliance mechanics	309		130
121	Therapists	305		244
122	Craft and kindred workers, nec	303		62
123	Sales managers, retail trade	300		337
124	Bus drivers	298		355
125	Painters and sculptors	297	37.0	207
126	Other laborers	297		216
127	Clinical laboratory technologists and technicians	295		268
128	Auto body repairers	295		199
129	Hucksters and peddlers	294	56.0	167
130	Punch and stamping press operatives	292		106
131	Dietitians	291		62
132	Radiologic technologists and technicians	290		102
133	Sales workers, retail trade	288		514
134	Religious, except clergy	287		53
135	Auto mechanics	285		1013
136	Clergy	284		277
137	Meter readers, utilities	284		53
138	Fork lift and tow motor operatives	284		363
139	Mixing operatives	283		77
140	Bottling and canning operatives	279		52
141	Managers and superintendents, building	278		158
142	Restaurant, cafeteria, and bar managers	275		707
143	Stenographers	275		72
144	Compositors and typesetters	274		171
145	Delivery and route workers	274		549
146	Miscellaneous machine operatives	273		1291
147	Painters, construction and maintenance	271	30.0	460
148	Insurance adjusters, examiners, and investigators	270		186
149	Painters, manufactured articles	269		162
150	Other health technologists and technicians	268		178
151	Demonstrators	267	51.0	105
152	Roofers and slaters	267		135
153	Drill press operatives	267		56
154	Warehouse laborers, nec	267		269
155	Checkers, examiners, and inspectors; manufacturing	265		786
156	Stock clerks and storekeepers	264		517
157	Prekindergarten and kindergarten teachers	262		239
158	Computer and peripheral equipment operators	260		551
159	Secretaries, legal	260		179
160	Cabinetmakers	260		73
161	Carpet installers	259	27.0	83
162	Freight and material handlers	259		735
163	Other precision machine operatives	258		57
164	Athletes and kindred workers	254		131
165	Molders, metal	253		52
166	Meat cutters and butchers	251		96
167	Construction laborers, except carpenters' helpers	250		743
168	Payroll and timekeeping clerks	247		226
169	Shipping and receiving clerks	247		515

Weekly Earnings by Occupation

Rank	Title	1981 weekly earnings	Percent self-employed	1981 employment (thousands)
170	Timbercutting, logging workers	246	35.5	99
171	Upholsterers	244		70
172	Newspaper carriers and vendors	242	38.0	111
173	Statistical clerks	242		361
174	Telephone operators	240		301
175	Taxicab drivers and chauffeurs	240		161
176	Winding operatives, nec	237		55
177	Assemblers	236		1145
178	Bakers	234		132
179	Radio operators	233		61
180	Collectors, billing and accounting	233		90
181	Miscellaneous clerical workers	233		1250
182	Miscellaneous operatives	232		831
183	Guards	232		593
184	Photographic process workers	230		85
185	Secretaries, nec	229		3587
186	Bookkeepers	227		1922
187	Practical nurses	227		395
188	Recreation workers	226		119
189	Cutting operatives, nec	226		271
190	Keypunch operators	223		243
191	Filers, polishers, sanders, and buffers	223		113
192	Carpenters' helpers	223		60
193	Mail handlers, except post office	222		172
194	Barbers	222	70.0	106
195	Vehicle washers and equipment cleaners	220		165
196	Janitors and sextons	219		1332
197	Housekeepers, except private household	219		133
198	Secretaries, medical	218		81
199	Billing clerks	216		151
200	Attendants, personal service, nec	215		97
201	Typists	213		1011
202	Stock handlers	212		968
203	Decorators and window dressers	210		123
204	Health aides, except nursing	209		304
205	Other office machine operators	208		60
206	Spinners, twisters, and winders	207		98
207	Packers and wrappers, except meat and produce	204		579
208	Sawyers	204		121
209	Library attendants, assistants	203		149
210	Enumerators and interviewers	202		57
211	Counter clerks, except food	201		352
212	Receptionists	200		660
213	Gardeners and groundskeepers, except farm	200		648
214	Messengers and office helpers	198		94
215	Bartenders	195		309
216	Other textile operatives	194		125
217	File clerks	192		307
218	Bank tellers	189		558
219	Garbage collectors	189		72
220	Animal caretakers, except farm	187		93
221	Welfare service aides	185		86
222	Building interior cleaners, nec	184		936
223	Dental assistants	183		139
224	Attendants, recreation and amusement	182		172
225	Garage workers and gas station attendants	179		340
226	Hairdressers and cosmetologists	179	42.0	564
227	Salesclerks, retail trade	178		2380
228	Farm laborers, wage workers	174		941
229	Dressmakers, except factory	173	28.0	114
230	Nurses' aides, orderlies, and attendants	172		1116
231	Cooks, except private household	171		1360
232	Cashiers	168		1621
233	Teacher aides, except monitors	167		373
234	Laundry and drycleaning operatives, nec	166		189
235	Food workers, nec, except private household	165		538
236	Clothing ironers and pressers	164		115
237	Sewers and stitchers	157		780
238	Shoemaking machine operatives	154		73
239	Child-care workers, except private household	151		417
240	Waiters and waitresses	150		1442
241	Waiters' assistants	143		217
242	Lodging quarters cleaners, except private household	142		175
243	Food counter, fountain workers	141		460
244	Dishwashers	135		249
245	Maids and servants, private household	126		457
246	Housekeepers, private household	123		98
247	Child-care workers, private household	80		443

Note: "Nec" means not elsewhere classified; "na" means not available.

For Librarians Who Feel Lost in the Stacks

by Ellen Brown

Varying reasons contribute to the desire of many librarians for a career change. Dissatisfaction with their role as seen through the eyes of teachers, administrators, and board members; increasingly tight budgets; school closings; salaries; the elimination of positions; and mounting discipline problems are but a few. Librarians, as well as other educators, are looking to leave the field in quest of a change, self-esteem, and higher salaries.

From research conducted this year, I have found that today's "information specialist" can definitely make a career change once the decision is made. I emphasize "information specialist," as I have found that many "librarians" who are finding themselves displaced or displeased think of themselves only as librarians. The first step in changing careers, then, is to recognize just who you are and what you can do. This can often be the most challenging, rewarding, and difficult aspect of a career change.

Living in a society that is dependent on the gathering and dissemination of information, a librarian has excellent marketable skills. All of those managerial, supervisory, analytical, organizational, planning, public relations, communications, and myriad other abilities that the skilled "information specialist/librarian" is fortunate to have can be used in the business world. Information specialists who wish to leave the library need to see their abilities in terms of one or two specific career goals. In other words, what would you love to be doing, using one or more of your skills, if given the opportunity?

Once this decision is made, it takes a great deal of work to organize one's career search. However, with careful planning and plenty of groundwork, the

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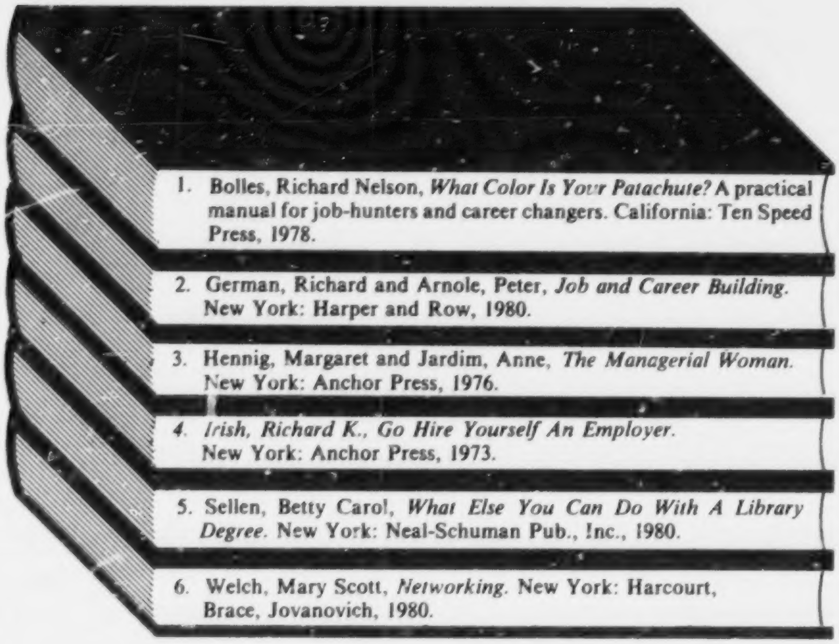

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business world is open. Those who inhabit it are often willing to listen and usually make suggestions to one in search of a specific career.

In my research, I contacted presidents, vice presidents, and general managers of both large and small businesses in rural and urban areas to gather their ideas on the possibility of librarians entering the business world at managerial levels.

Initial reactions to the notion that a librarian would be considering a business career were dismay and curiosity. Nearly all of the executives contacted were interested in how I felt a librarian could make the transfer. As one businessman stated, he did not see "how a librarian could handle herself in the insane world of business compared to the safe, secure, unchanging world of a library." When I finished educating this gentleman as to the real world of libraries, he admitted his "views of libraries and librarians had changed 180 degrees."

As we are all too well aware, very few people understand what an information specialist actually does. Thus many business managers would never dream that such a person could fill their needs very well. However, with confidence that there is no one else with the many capabilities that you have, it is not difficult to broaden the view of many business executives as to the assets such a background can bring to an organization.

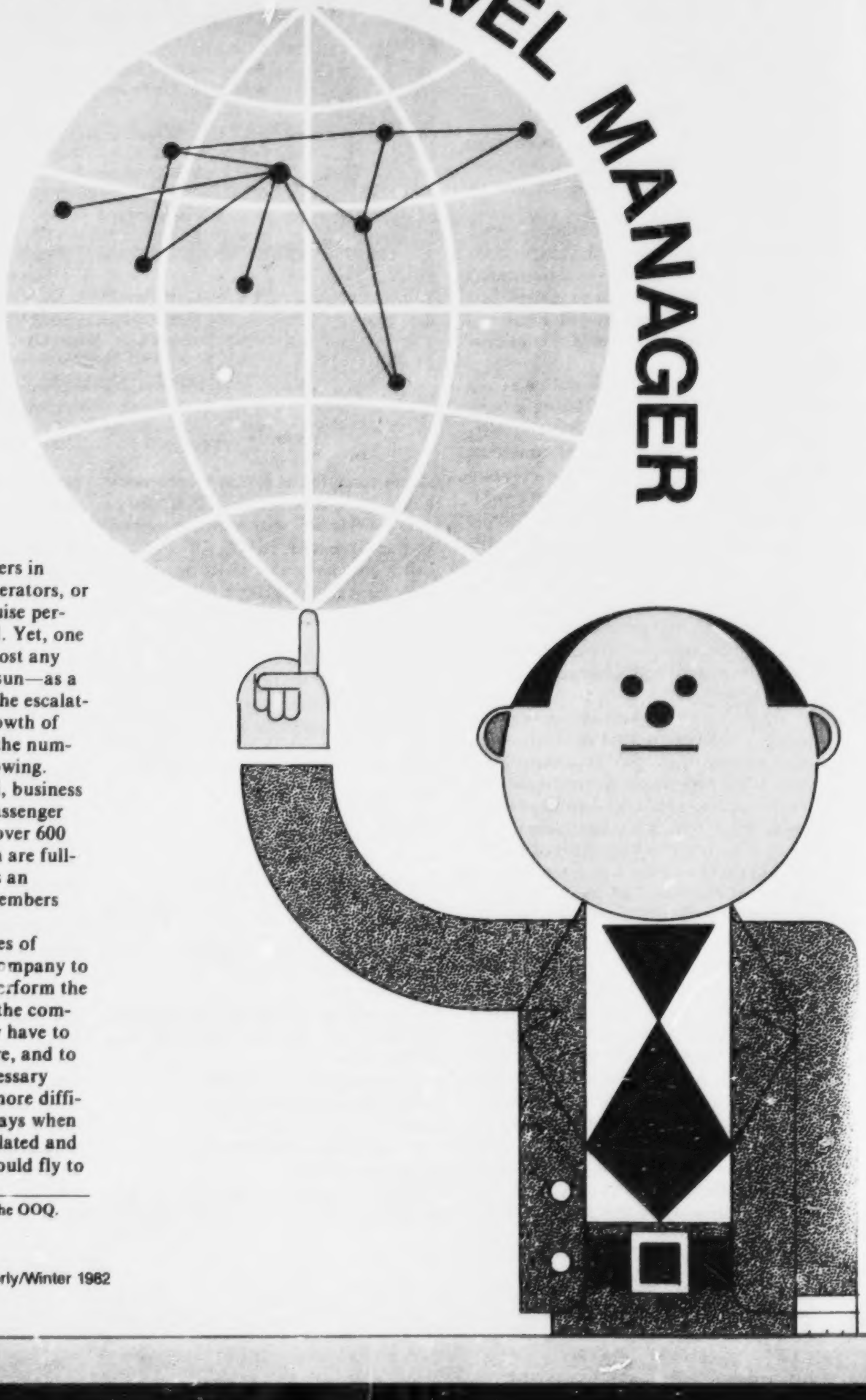
All of the businessmen I interviewed were interested in the qualities librarians have as generalists. All felt that a librarian's abilities to communicate and deal with people on all levels were definite assets. Also, a librarian's organizational abilities coupled with an advanced degree were proof to many executives that an intelligent, hard-working, competent person that could be useful to their businesses in diverse ways was hidden behind the shelves. None of the businessmen felt it would be necessary to take a cut in pay or for a librarian to take courses towards another degree. As one executive stated, "If you can prove you have the skills needed, a manager will not want to lose you and will be willing to pay for any additional schooling."

Before convincing others of your skills, you must first see yourself in business terms. Beyond image building, it is necessary in pursuing a career to build one's skills into a marketable service. Because of your library background you can

- gather statistics
- analyze data
- promote products
- manage materials and people
- conduct extensive public relations services
- create advertising campaigns
- act as a troubleshooter
- conduct surveys
- write reports, grants, job descriptions
- develop systems for collecting and storing data
- communicate on all levels
- facilitate time-management studies
- initiate and develop programs
- promote and manage budgets
- train personnel.

Seeing yourself as an asset to any business is a first step toward changing careers. How do you choose which career? As a librarian looking for a career change, by all means READ. Today, as a result of the information explosion and job burnout there is a plethora of current books that specifically lead the reader through encouraging techniques and strategies to use when looking for a job. Put them to good use. Purchase your own copies and mark them up. Read and reread. Choose the reference you like best and refer to it continually. Set up a card file. Do not go to any meeting, workshop, or conference without making a point of meeting at least one new person. Make sure you obtain their address, telephone number, and other information regarding them professionally as well as personally. Keep this information on a card in your file. Your main purpose when doing serious job searching is to create a vast network of friends, acquaintances, colleagues, or just plain contacts. Speaking of networks, join one. If you cannot find one, start one. But above all, stop the self-denial, the lack of confidence, and the complaining. Get out and do something. I am convinced that although there is unemployment, dynamic, self-confident people with marketable skills are not long unemployed. And those that are employed can change careers! ooo

You're a **What**? TRAVEL MANAGER



by Gail M. Martin

When one thinks about careers in travel, travel agents, tour operators, or people who are airline or cruise personnel usually come to mind. Yet, one can work "in travel" for almost any kind of company under the sun—as a travel manager. Because of the escalating cost of travel and the growth of special money-saving fares, the number of travel managers is growing. According to Lynn Trimboli, business manager for the National Passenger Traffic Association (NPTA), over 600 members of her organization are full-time travel managers. This is an increase of more than 200 members since last year.

Although the specific duties of travel managers vary from company to company, travel managers perform the same basic function: To get the company's employees where they have to be when they have to be there, and to assure that they have all necessary accommodations. This is a more difficult task than it was in the days when the airlines were tightly regulated and were told which cities they could fly to

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and how much they must charge. Nowadays, airlines have more leeway in choosing their routes, and their fares may change from week to week. Keeping track of airline routes and discount fares could easily take up the time of a full-time employee. One large insurance company, as a matter of fact, uses a computer to keep attuned to new airfares.

It's not surprising then, that when asked to describe his job as travel manager for Gulf Oil, John Travers exclaimed: "Hectic—there are no regular hours, there's always something to do." The responsibility delegated to the typical travel manager is substantial. Athough some travel managers work alone, or with one or two assistants, other travel managers head a whole department with many assistants, depending on the size of the company and the amount of travel employees do. Joan Atkins, corporate travel manager for Boeing Company, has 24 assistants on her staff. They arrange 72,000 trips per year for 9,000 frequent travelers. Shirley Leney, travel manager for Wang Inc., arranges travel for 7,200 frequent travelers in her company. She has a staff of 5 people.

Travel is an important business expense for many companies. The travel manager must know what's being spent on travel within the company and its departments and how to keep this figure as low as possible. In this respect, professional societies (like NPTA) can be very helpful. The activities of NPTA, such as the annual conference, allow travel managers from various companies to meet and compare notes. Travel managers benefit from hearing how other travel managers are solving their problems and keeping costs down. For example, when Shirley Leney started her job as travel manager, she in reality also founded her department. One of the first items of business was to consult other corporate travel managers to hear how their departments were set up and how they functioned.

Most travel managers arrange for hotel accommodations for company employees. By negotiating with hotel managers, the travel manager can usually get a reduced company rate. Likewise, the travel manager may arrange for car rentals at the best rate. The travel manager may also establish a budget for meals for travelers, arrange for credit cards, and secure passports or visas.

Some travel managers also plan conferences. According to Runzheimer and Co., a consulting firm, about 40 percent of travel managers that they surveyed plan conferences. In arranging conferences, travel personnel may schedule the event, pick a location, make travel arrangements, and even book speakers. In choosing a location, travel managers consider several things: Proximity of the hotel to the airport, adequacy of parking facilities, availability of special group rates for rooms, number and size of meeting rooms, and availability of entertainment and recreational facilities. To check out hotel facilities and meeting rooms, some travel arrangers use a meeting room checklist or provide such a checklist to their company supervisors. The checklist provides a rundown on such items as seating plan, cooling and heating controls, acoustics of the room, lighting, microphone, projection equipment, and projection screen.

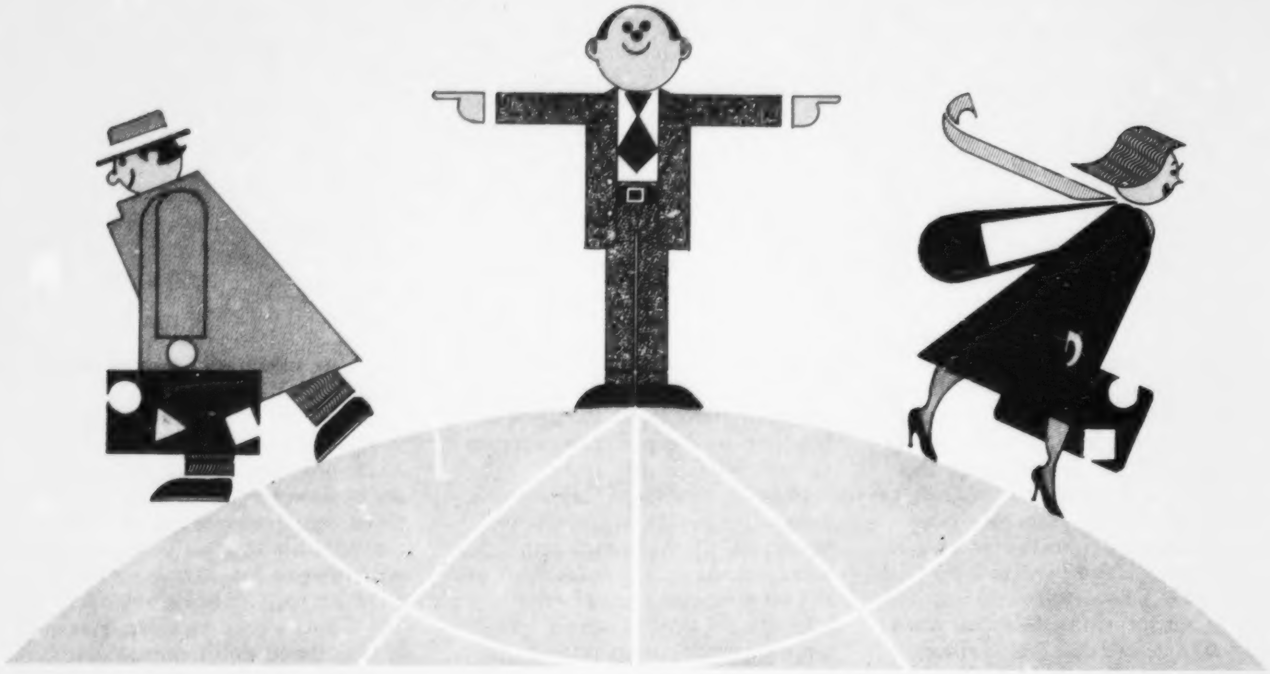
To best carry out their function, travel managers sometimes establish relationships with travel agencies. This arrangement ensures that the company gets the prompt and efficient services of a professional travel agent, as well as that the employees stay within company guidelines—such as always traveling coach.

Despite the differences in size of the companies travel managers work for, or the programs they administer, all travel managers need similar skills. Good organizational and administrative skills are absolutely necessary. According to John Travers: "Doing a good job requires being well organized and having a good memory. You must be acquainted with airline routes, accommodations, conference planning, and the requirements for entering foreign countries. All of this requires constant reading to stay abreast of these and other travel developments. Every day I read several newspapers, travel journals, and travel literature from the airlines." He points out another important qualification for his job. "A travel manager must have a good knowledge of geography of almost every country in the world. In the oil business, you never know where you'll be going next."

Shirley Leney thinks that analytical skills are the most crucial to managing a travel department. She says, "Analytical skills are very important to this job—being able to determine what something costs and evaluate its worth. A lot of your success as travel manager is determined by astute financial analysis." One of Leney's assistants is an accountant with an MBA, who, she says, is a key staff member.

A travel manager must also be adept at working under pressure because arrangements must often be made on short notice. In addition, a travel manager must be good with details. John Travers suggests, "A lot of things a travel manager must do is follow-up work—making sure that what you requested has been accomplished."

Tact may also be very useful for the travel manager. Joan Atkins says



maintaining cordial relations with the company's employees is a big part of her job, because the travel manager may be asking employees to make sacrifices in the interest of savings for the company. Says Shirley Leney, "The travel manager needs management support. To tell office directors and managers that they and their staff can't fly first class may require that you use a great deal of tact."

Travel managers also need an acute business sense. This sometimes requires good negotiating skills to work out the best deals. Shirley Lenney says, "I love the negotiating aspect of my job—negotiating with hotel or car rental personnel. You have to learn first hand how far you can go in negotiating and what you can get for the company. You never know what's available unless you ask."

Examples of the best way to enter the field of travel management are hard to find. Some travel managers seem to have entered the field by accident. Travel managers do recommend getting as much experience and knowledge as possible about travel. Working as a travel agent may provide some of the knowledge travel managers say is important for their jobs. Since negotiating and meeting with various representatives of hotels, airlines, and car rental agencies is an important part of his job, one travel manager recommended any type of job that involves meeting the public, including sales work, that could develop these skills.

Travel managers at work today entered the field through a wide variety of ways. John Travers has spent 26 years in the travel department, the last 10 as manager, but was originally an expediter in the exploration and production department. Shirley Leney created her own position as travel manager. She was manager of customer communications at the company when she first thought that offering herself as a travel manager might appeal to the cost-conscious management of the company. She talked to the executive vice-president about setting up a travel department and soon she became its head.

According to those in the field, salaries and opportunities for advancement are good for travel managers. Annual salaries may range from the high teens for small companies, to $35,000 for medium-sized companies. Since more and more companies are hiring travel managers, chances to switch to another company and a position of greater responsibility are improving. Travel management might also lead to higher positions within the same company.

There are negative aspects of the travel manager's job, too. According to Keith Meehan, travel manager for PPG industries, "Keeping people satisfied can be a hard job. Travel management is a service-oriented field; and, in this type of work, you're always trying to satisfy people." According to Joan Atkins, the long hours required in the field can be quite demanding.

Almost all travel managers will admit to having a certain love for their job, however. For Clay Milligan, this attachment stems from his 25 years of experience maintaining aircraft before becoming a travel specialist with Texas International Airlines. "I'm dealing with airplanes and the aircraft industry—which is great—and I have great freedom of movement," he says, adding, "I have no complaints, I love it." This freedom of movement also pleases John Travers. He remarks, "I'm able to visit travel agents around the country and to travel to sites I'm sending employees to. This, as well as the opportunity to meet new people all over the world, is a great bonus of my job."

For Joan Atkins, the good pay along with the challenge of her job are what keep her going, and this sentiment is expressed also by her colleague, John Travers. He sums it all up—"It's certainly a challenge, and the industry is constantly changing. It keeps you young!"

Counseling Aids

How We Do It: Student Selection at the Nation's Most Prestigious Colleges, by Edward B. Wall, Dean of Admissions at Amherst College, describes how his school decides which applicants are accepted. Its 24 pages contain explicit information about Amherst and much general advice for college bound high school students. For example, numerous profiles of students who are actually accepted show the great variety of achievements that can lead to admission. Parents, too, will find useful information in the booklet. Published by Octameron Associates, Inc., P.O. Box 3437, Alexandria, Va. 22302. Price: $1.50, plus 50 cents for postage.

Don't Miss Out: The Ambitious Student's Guide to Scholarships and Loans, Seventh Edition, 1982-84, by Robert Leider, has 60 pages of advice and information about paying for a college education. Federal, State, and private sources of aid are listed and discussed. It even has a section on holding down the cost of going to school in the first place. Published by Octameron Associates, Inc., P.O. Box 3437, Alexandria, Va. 22302. Price: $2.50, plus 50 cents for postage.

The World of Work, A General Electric Communications Program, covers a wide range of careers with a series of booklets and full-color posters. The booklets, illustrated with full-color photographs, run to 20 pages or more. The following titles have been published: **Planning your career** (Discusses how to get the most out of high school; stresses the importance of communication skills, mathematics, social studies, and foreign languages; suggests some high school courses for students to take for each of the major occupational groups.) **So you want to work** (looks at broad occupational fields such as communications, transportation, forestry and farming, the building trades, mining and petroleum, electric power, services, clerical and sales, machine trades, mechanics and repair, and semiskilled and unskilled work.) **What's it like to be an engineer?** (Describes the major engineering fields and suggests what to do in high school to begin preparing for a career in engineering.) **What's it like to be a technician?** (Provides an introduction to technician occupations in science, engineering, health, aviation, broadcasting, computers, and design.) Single copies of the booklets are available from Educational Communications Programs, General Electric Company, Fairfield, Conn. 06431.

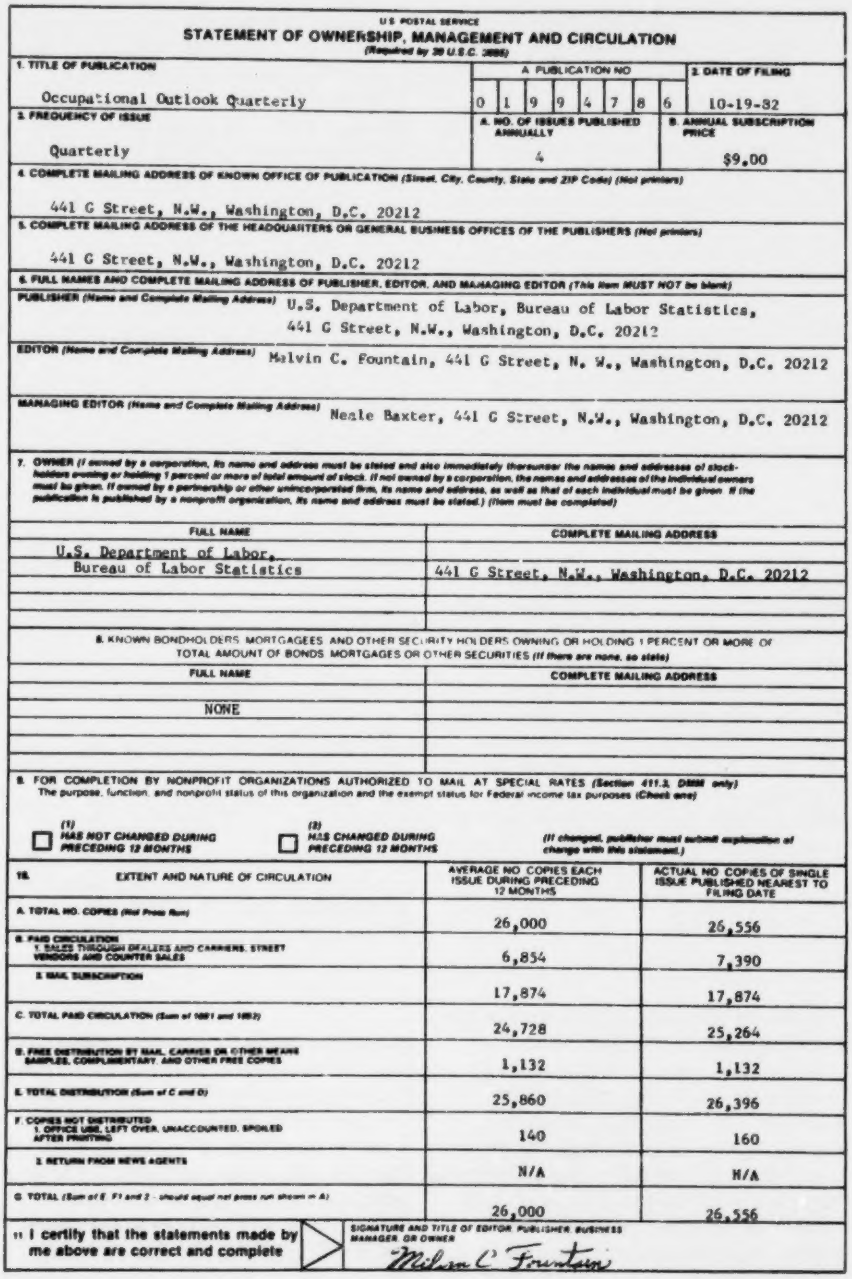
Careers in Insurance provides descriptions of jobs in sales, underwriting, and claims; professional and technical challenges; opportunities in education and training. A 24-page booklet, it is available from the publisher, Alliance of American Insurers, 20 North Wacker Dr., Chicago, Ill. 60606.

Petroleum Industry Careers, a 6-panel flyer, covers a large number of jobs in energy exploration, production, and transportation. Besides brief explanations of what is involved in various fields, it lists numerous job titles and indicates the training or education required for each. It is available from Amoco Educational Services, Public Affairs—MC-3705, P.O. Box 5910-A, Chicago, Ill. 60680.

Economic Responsibilities of Working Women, 6 pages, indicates that women work for the same reasons men do—most importantly, to provide for the welfare of themselves, their families, or others. About 45 percent of the women in the labor force in March 1982 had never married or were widowed, divorced, or separated. In addition, the 3.3 million married women workers whose husbands had incomes below $7,000 in 1981 almost certainly worked because of economic need. A chart included in the publication shows that all working wives contribute 27.3 percent of their earnings to family income. By income, the largest proportion contributed to family income, 31.5 percent, was contributed by working wives when the family income was between $3,000-$4,999 a year. The smallest proportion was contributed by wives when the family income was either very low (8.7 percent, under $3,000) or very high (21.5 percent, $50,000 and over). Available free from the U.S. Department of Labor, Office of the Secretary, Women's Bureau, Washington, D.C. 20210. Include a self-addressed label.

Information Concerning Employment and Training Opportunities in the U.S. Merchant Marine describes seafaring employment with steamship companies that operate U.S. registered merchant ships. Recruitment of inexperienced personnel for entry positions is low, the pamphlet notes; but the employment picture is better for graduates of maritime training programs and for those with some experience. This 11-page publication lists the regional offices of the Maritime Administration that can provide information on seafaring employment and training and United States Coast Guard officers responsible for licensing and documentation of all U.S. merchant mariners. The publication gives typical salaries for various positions and general requirements for employment. It also indicates alternative employment such as working on Great Lake ships, on tankers, with Military Sealift Command, and others. It describes possible maritime training and lists schools and supplemental training programs. Available free from the Maritime Administration, U.S. Department of Transportation, 400 7th St. SW, Washington, D.C. 20590.

Careers in the Hospitality Industry, 16 pages, points out that if "you are seeking an exciting future, enjoy meeting and working with people in a growing industry with good pay, job security, and the opportunity to travel and live in different places, you may be just the person who should seek a career in the lodging industry." The publication goes on to explain that there are three major classifications in the field: professional, middle management, and skilled. It describes the requirements for work in the industry, the types of lodging facilities, and the the various departments in lodging facilities. Opportunities for high school, junior or community college, and university graduates are indicated. Single copy available free from the American Hotel and Motel Association (Careers), 888 Seventh Ave., New York, N.Y. 10019. Include a stamped, self-addressed #10 envelope.



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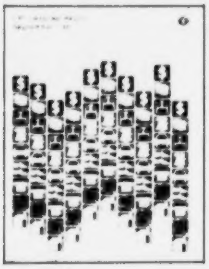

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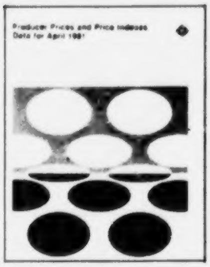

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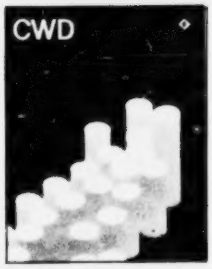

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